Significance statement

[illegible]

Introduction

[illegible]

Modeling framework

[illegible]

Formal model

$$x_a = \beta_a \lambda + (- \beta_a)\lambda$$
$$x_b = \beta_b \lambda + (- \beta_b)\lambda$$

Table 1. Model parameters and constraints.

Parameters/Constraints	Explanation
a and b	Two actions for each individual to choose from.
$x_a \geq 0$ and $x_b \geq 0$	Random numbers of offspring that correspond to choices a and b.
$\lambda_1 \geq 0$ and $\lambda_2 \geq 0$	Two environmental factors that determine fitness, independent and identically distributed (IID) over time and identical for all individuals in a given generation.
$\beta_a \in [0, 1]$ and $\beta_b \in [0, 1]$	Individual characteristics that determine the loading of fitness on factors.
$p \in [0, 1]$	Individual behavior, defined as the probability to choose action a.
$f \equiv (p, \beta_a, \beta_b)$	An individual's type, which is the unit of selection in evolution because it completely characterizes an individual.
$\mu(p, \beta_a, \beta_b)$	Log-geometric-average population growth rate for individuals of type $f \equiv (p, \beta_a, \beta_b)$.
$f^* = (p^*, \beta_a^*, \beta_b^*))$	The growth-optimal type that yields the fastest population growth rate.

β_a fi β_b x_a x_b fi a b a b fl “ a b” fl

$f \equiv p_- \beta_{a-} \beta_b$ ’ $type$ fi $\beta_{a-} \beta_b$ a b p f f f f_- f fi fi i f p_- β_{a-} β_b

Individual behavior

$p \in$ b a $-p_-$ I^p

$$x^p = I^p x_a + (\quad - I^p) x_{b-}$$

$$I^p = \begin{cases} \quad p \\ \quad -p. \end{cases}$$

p ’ $behavior$ a b p $-p$ p β_{a-} β_b

$$x_i^{p\text{-}\beta_a\text{-}\beta_b} = I_i^p x_{a_i}^{\beta_a} + (\quad - I_i^p) x_{b_i}^{\beta_b}$$

$$x_{a_i}^{\beta_a} = \beta_a \lambda \quad + (\quad - \beta_a) \lambda$$
$$x_{b_i}^{\beta_b} = \beta_b \lambda \quad + (\quad - \beta_b) \lambda$$

i β_a β_b fi i

Population dynamics

f p_- β_{a-} β_b T n_T^f $-$ n_T^f T_- T^- n_T^f

T^{-} n_T^f

$$\mu(p, \beta_a, \beta_b) = \mathbb{E}\Big[\quad \Big(p x_a^{\beta_a} + (\quad - p) x_b^{\beta_b}\Big)\Big],$$

$x_a^{\beta_a}$ $x_b^{\beta_b}$, fi a b
$-$ f p, β_a, β_b,
fi

$$\begin{aligned} \alpha \quad &= p\beta_a + (\quad - p)\beta_b \\ \alpha \quad &= p(\quad - \beta_a) + (\quad - p)(\quad - \beta_b) \end{aligned}$$

$$\mu(p, \beta_a, \beta_b) = \mathbb{E}[\quad (\alpha \ \lambda \ + (\quad - \alpha \ )\lambda \ )],$$

λ λ α α

β_a β_b p (α^*)

$$\lambda = \begin{cases} q & \lambda \equiv \\ -q & \end{cases}$$

q

λ

x

x

$$x = \beta \lambda + (- \beta)\lambda$$
$$x = \beta \lambda + (- \beta)\lambda$$

β β

Binary choice model of political polarization

λ

λ

A simple example

Proposition 2. *Under assumptions (A1) and (A2) and the environment speci ed by and , the population growth rate in can be evaluated explicitly as*

$$\mu \quad (p) \quad = q \quad (\quad - p) + (\quad - q) \quad (\quad + p)$$
$$\mu \quad (p) \quad = q \quad (\quad + p) + (\quad - q) \quad (\quad - q)$$

and the behavior (value of p) that maximizes this growth rate is

$$p \quad = \begin{cases} \quad & \text{if } q \leq \\ \quad - \quad q & \text{if } \quad q \\ \quad & \text{if } q \geq \end{cases}$$

$$p \quad = \begin{cases} \quad & \text{if } q \leq \\ q - \quad & \text{if } \quad q \\ \quad & \text{if } q \geq \end{cases}$$

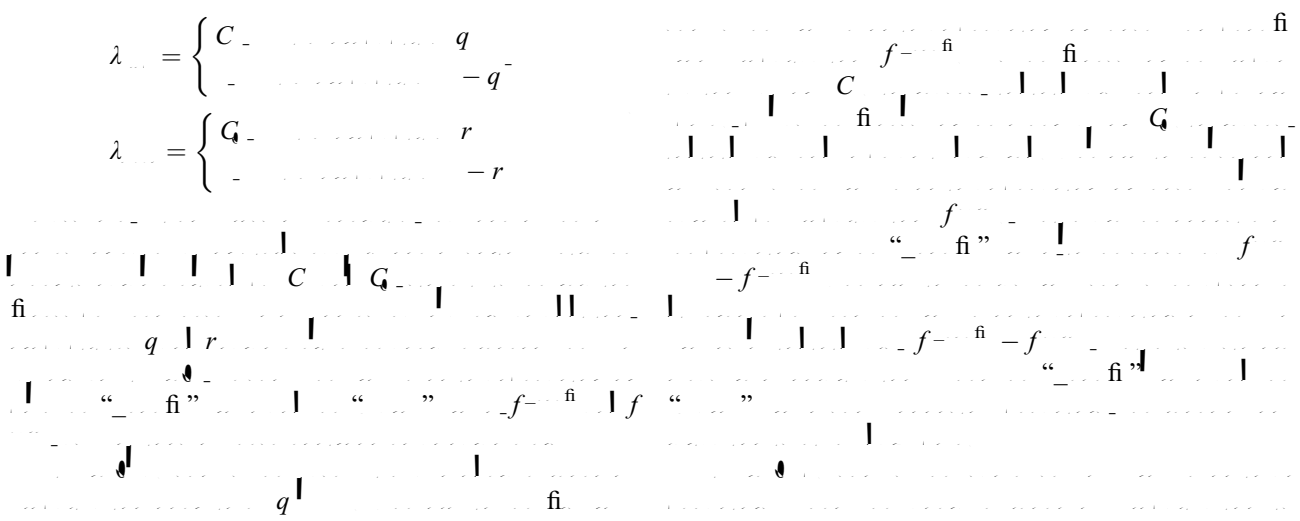
p fi p
q
fi p fi
p
fi
fi
,
fi p
fi
fi

“ ”
λ

Figure 2. Growth-optimal behaviors for both the "Benefit" group and the "Harm" group, $f^{Benefit}$ and f^{harm}, as functions of environmental parameters. (2a): moderate globalization with $q = 0.5$. (2b): high globalization with $q = 0.9$. The first row shows $f^{Benefit}$; the second row shows f^{harm}; the last row shows the absolute difference, that is, polarization: $|f^{Benefit} - f^{harm}|$.

$$\lambda = \begin{cases} C & q \\ & -q \end{cases}$$

$$\lambda = \begin{cases} G & r \\ & -r \end{cases}$$



q [illegible] C [illegible] C [illegible] fi [illegible] $(\beta$ [illegible] $= \beta$ [illegible] $=)$ [illegible] $(\beta$ [illegible] $= \beta$ [illegible] $=)$ [illegible] fi [illegible] β [illegible] “ [illegible] ” [illegible] fi [illegible] q [illegible] r [illegible] “ [illegible] ” [illegible] r [illegible] fi [illegible] *because* [illegible]

Binary choice model of bias and discrimination

[illegible]

A simple example

[illegible] “ [illegible] ” [illegible] “ [illegible] ” [illegible] ’ fi [illegible] λ_A [illegible] λ_T [illegible] λ_A [illegible] λ_T λ_A [illegible] λ_T [illegible]

$$\lambda_A = \begin{cases} \text{[illegible]} & q \\ \text{[illegible]} & -q \end{cases}$$

$$\lambda_T = \begin{cases} \text{[illegible]} & r \\ \text{[illegible]} & -r \end{cases}$$

ðp Þ ¼qð1 r Þlogð1 þ p Þ

þ ð1 q Þ logð1 þ p Þ (18)

þ ð1 q Ðð1 r Ðlogð2 p Ðþ

References

Annual Review of Ecology and Systematics

The Imperative of Integration

Theoretical Population Biology

Evolutionary Ecology Research

Towards a Non-discriminatory Algorithm in Selected Data

Discrimination in Labor Markets

The Limits of Organization

The Adapted Mind: Evolutionary Psychology and the Generation of Culture

The Economics of Discrimination

European Physics Journal B

The Quarterly Journal of Economics

Econometrica

Inaccurate Statistical Discrimination

The Quarterly Journal of Economics –

Quarterly Journal of Finance –

Plos One

Quarterly Journal of Finance

European Economic Review –

Genetical Research –

Evolution; International Journal of Organic Evolution –

Evolutionary Psychology: The New Science of the Mind

Journal of Economic Literature

The Review of Economic Studies

Experimental Economics

The American Naturalist

American Economic Review

American Economic Review "fl"

Journal of Theoretical Biology

American Economic Review

On the Origin of Species

The Sel sh Gene

Physical Review

European Journal of Operational Research

The Future Is Faster than You Think: How Converging Technologies Are Transforming Business, Industries, and Our Lives

Genetics –

Plos Biology

The Journal of Finance –

International Communication Gazette

Journal of Theoretical Biology –

Journal of Evolutionary Biology

Journal of Evolutionary Biology

Journal of Evolutionary Biology

The American Naturalist

Populations in a Seasonal Environment

The B.E. Journal of Theoretical Economics –

Contesting Stereotypes and Creating Identities: Social Categories, Social Identities, and Educational Participation

Evolutionary Ecology –

Adaptive Thinking: Rationality in the Real World

Neuroeconomics: Decision Making and the Brain

" *Educational Leadership*

Decision Support Systems –

Com-

Journal of Theoretical Biology –
Ecology –
On Intelligence
American Economic Journal: Microeconomics –
Journal of Law and Economics –
The Ants
Advances in Collective Intelligence 2011 –
Learning Health Systems
Mental Models: Towards a Cognitive Science of Language, Inference, and Consciousness
The Psychology of Diversity: Beyond Prejudice and Racism
Behavioral Ecology –
Proceedings of the Sixth Berkeley Symposium on Mathematical Statistics and Probability, Volume V –
Quarterly Journal of Economics –
The Journal of Finance
Journal of Economic Theory
Psychological Science
Difference without Domination
Business & Information Systems Engineering
Philosophical Transactions of the Royal Society B: Biological Sciences
Journal of Portfolio Management
Journal of Investment Consulting –
Financial Analysts Journal
Handbook of Systemic Risk –
Adaptive Markets: Financial Evolution at the Speed of Thought
Plos One
Journal of Bioeconomics –
Proceedings of the National Academy of Sciences
Journal of Economic Theory
Biotic Interactions and Global Change
Futures –
Superminds: The Surprising Power of People and Computers Thinking Together
MIT Sloan Management Review
Dynamic Modeling in Behavioral Ecology
Evolution and the Theory of Games
Behavioral and Brain Sciences –
Nature
Evolutionary Ecology
Introduction to the Compass Books Edition of Gustave LeBon, the Crowd
Proceedings of the Royal Society B
Science –

American Economic Review: Insights

Experientia

Inequality Aversion, Populism, and the Backlash against Globalization

Physica A: Statistical Mechanics and Its Applications

Physica A: Statistical Mechanics and Its Applications

Physica A: Statistical Mechanics and Its Applications

American Economic Review

Cognition

Science

The Language Instinct: How the Mind Creates Language

Bio Systems

Annual Review of Ecology and Systematics

This Time Is Different: Eight Centuries of Financial Folly

Proceedings of the National Academy of Sciences

American Psychologist

Journal of Economic Theory

Journal of International Business Policy

Annual Review of Economics

American Economic Review

Industrial Management Review

The Psychology of Stereotyping

Programming Collective Intelligence: Building Smart Web 2.0 Applications

Oxford Surveys in Evolutionary Biology

American Zoologist

Foraging Theory

The Wisdom of Crowds

Socio-Economic Review

Nature

Journal of Mathematical Biology

Sociobiology: The New Synthesis

Current Directions in Psychological Science

Science

Nature

Evolutionary Ecology

Researches on Population Ecology

Plos One

Proceedings of the National Academy of Sciences