Zero-Sum Thinking, the Evolution of Effort Suppressing Beliefs, and Economic Development

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Demotivating beliefs

- Across societies, the presence of demotivating beliefs (that curb ambition and excessive effort) is surprisingly common.
  - Nordic countries: Law of Jante
  - Australia & New Zealand: Tall poppy syndrome
  - Japan: 'the nail that sticks up will be hammered down'
  - Evil eye, 'witchcraft', and envy
- It's deviation from these beliefs that is exceptional (e.g., has been used to explain the rise of Western Europe):
  - 'Need for achievement' (McClelland, 1961)
  - 'English individualism' (MacFarlane, 1978)
  - 'Bourgeois virtues' (McCloskey, 2006)
  - 'Spirit of capitalism' (Weber, 1930)

George Foster and the 'Image of Limited Good'

According to Foster:

- In traditional societies, where there is little innovation, specialization, and economic growth, almost everything 'good' is in 'limited' supply.
  - Resources are limited (e.g., land, authority, prestige, spouses, and even happiness).
  - One person's gain comes at the expense of others.
- The result is in an 'Image of Limited Good.'
  - Fosters conclusions were based primarily on extensive fieldwork in Tzintzuntzan, Mexico.
- This (often subconscious) 'worldview' explains the social and cultural features of small-scale pre-industrial societies.
  - Envy, sharing norms, witchcraft, etc.

Overview

The paper does two things:

1. Formalizes Foster's argument, deriving testable predictions.
   - Model of cultural evolution.
2. 'Tests' the predictions of the model.
   - Two samples from the Democratic Republic of the Congo (collected in 2015 and 2019).
   - A broad range of countries from the World Values Survey (WVS).

Model: Players

- Population that is a continuum of mass one.
- Time is continuous.
- Individuals are characterized by adherence to a set of possible cultural beliefs, indexed by i.
  - $\Theta = \{\theta_1, \theta_2, \ldots, \theta_n\}$, where each belief $\theta_i \in [0, 1]$.
  - Share of population that believes in a θ_i is q_i.
  - Vector of belief prevalence: $\mathbf{q} = (q_1, q_2, \ldots, q_n)$.

Actions

- Individuals are matched and "produce."
- Each chooses the effort devoted to production, x.
- Effort generates output: $A x^{\frac{1}{2}}$.
  - A is the level of technology.
- The cost of effort is: $c(x) = \frac{1}{2}x$.
- Production consists of a series of tasks, a fraction $\alpha \in [0, 1]$ of which are zero-sum.
  - For zero-sum tasks, a player's gain comes (fully) at the expense of their partner.
  - Alternatively, could interpret α as the probability that all production is zero-sum.

The zero-sumness of production

(Match between two players: types i and j)

Output is given by:

$$\begin{aligned} Y_i &= \alpha\,(A\,x_i^{\frac{1}{2}} - A\,x_j^{\frac{1}{2}}) + (1-\alpha)\,A\,x_i^{\frac{1}{2}} \\ Y_j &= \alpha\,(A\,x_j^{\frac{1}{2}} - A\,x_i^{\frac{1}{2}}) + (1-\alpha)\,A\,x_j^{\frac{1}{2}} \end{aligned}$$

Illustrative examples:

1. Non zero-sum, $\alpha = 0$:

$$Y_i = A\,x_i^{\frac{1}{2}} \quad \text{and} \quad Y_j = A\,x_j^{\frac{1}{2}}$$

2. Fully zero-sum, $\alpha = 1$:

$$Y_i = A\,(x_i^{\frac{1}{2}} - x_j^{\frac{1}{2}}) \quad \text{and} \quad Y_j = A\,(x_j^{\frac{1}{2}} - x_i^{\frac{1}{2}})$$

3. In general, $\alpha \in [0,1]$:

$$Y_i = A\,(x_i^{\frac{1}{2}} - \alpha x_j^{\frac{1}{2}}) \quad \text{and} \quad Y_j = A\,(x_j^{\frac{1}{2}} - \alpha x_i^{\frac{1}{2}})$$

Allowing for demotivating beliefs, θ

- If the world is (at least partially) zero-sum, $\alpha > 0$, then the equilibrium levels of effort (x_i^*, x_j^*) are **higher** than is socially optimal.
  - If both i and j reduced their effort slightly, both would be better off.
- We allow for demotivating beliefs that lower the perceived returns to effort.
  - E.g., tall poppy syndrome, envy, evil eye, supernatural harm, beliefs about ineffectiveness of effort, sharing norms, etc.
  - Assume return to effort is perceived to be lower by a factor of $\theta \in [0, 1]$.

Utility and effort

(True) material payoff:

$$U(x_i, x_j) = A\left(x_i^{\frac{1}{2}} - \alpha x_j^{\frac{1}{2}}\right) - \frac{1}{2}x_i$$

(Perceived) subjective payoff:

$$\hat{U}(x_i, x_j) = A\left(\left[1 - \theta_i\right] x_i^{\frac{1}{2}} - \alpha x_j^{\frac{1}{2}}\right) - \frac{1}{2}x_i$$

- α is the zero-sumness of production.
- θ_i is the demotivating belief of type i.

Equilibrium effort:

$$x_i^* = (1 - \theta_i)^2 A^2$$

Matching and dynamics

Matching:

- Assume some degree of positive assortative matching.
  - σ is the likelihood of an own-type match.
  - $1 - \sigma$ is the likelihood of a random match.

- Assortative matching arises from the presence of homogenous communities or homophily in networks.

Dynamics:

- Evolution of types is governed by a standard replicator dynamic.
  - A type's population share is increasing in its 'fitness' relative to other types.
  - Fitness is determined by (true) **material payoffs**.
    - Not by (perceived) subjective payoffs.

Payoffs and Definitions

Material welfare for type θ_i at time t equals *material payoffs* evaluated at the equilibrium effort levels $(x_i^*)_{i=1}^n$ and averaged over all interactions:

$$W_i\left(\mathbf{q}(t)\right) \quad = \quad \sigma U(x_i^*, x_i^*) + (1-\sigma) \sum_{j=1}^{n} q_j(t)\, U(x_i^*, x_j^*)$$

Subjective well-being equals the *subjective payoffs* evaluated at the equilibrium effort levels and averaged over all interactions:

$$\hat{W}_i\left(\mathbf{q}(t)\right) \quad = \quad \sigma \hat{U}(x_i^*, x_i^*) + (1-\sigma) \sum_{j=1}^{n} q_j(t)\, \hat{U}(x_i^*, x_j^*)$$

The emergence of demotivating beliefs

Zero sum $\alpha \Rightarrow$ Demotivating beliefs θ

Proposition 1:

- After enough time, the belief $\theta^* = \sigma\alpha$ will be driven to fixation.
  - The 'true' belief, $\theta_i = 0$, is driven to extinction.

- That is, in a (partially) zero-sum world ($\alpha > 0$), demotivating beliefs can arise.
  - With (some) zero-sum production, equilibrium effort is higher than is optimal for the pair.
  - Demotivating beliefs can move effort closer to the socially optimal level.
  - Some positive assortative matching $\sigma > 0$ is needed for this to occur.
    - If same types are more likely to be matched together, then the socially-beneficial (lower) effort is reciprocated.

Material welfare within groups

Given α: Demotivating beliefs $\theta \Rightarrow$ Material welfare W

Proposition 2:

- For a fixed degree zero-sumness α:
  - The demotivating belief $\theta^* = \sigma\alpha$ maximizes material welfare W.
  - Deviations from θ^* (in either direction) reduces material welfare.
  - In other words, material welfare is concave (hump-shaped) in demotivating beliefs.

Subjective wellbeing within groups

Given α: Demotivating beliefs $\theta \Rightarrow$ Subjective wellbeing $\hat{W}$

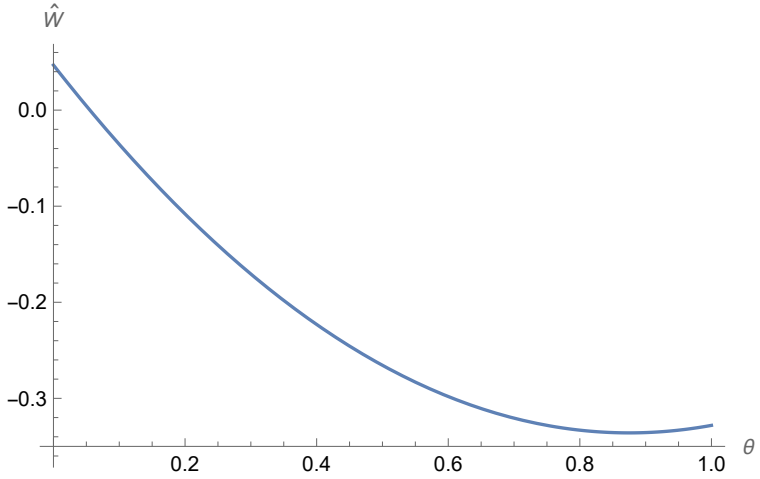
Proposition 3:

- For a fixed degree zero-sumness α:
  - A player's subjective wellbeing, $\hat{W}$, is (generally) decreasing in the strength of their demotivating beliefs θ.
  - True as long as the strongest demotivating belief in the population is not too intense: $\max \Theta \leq 1 - \sigma\alpha$.
  - Otherwise, $\hat{W}$ is increasing for the highest values of θ.
    - Although the increase is modest numerically.

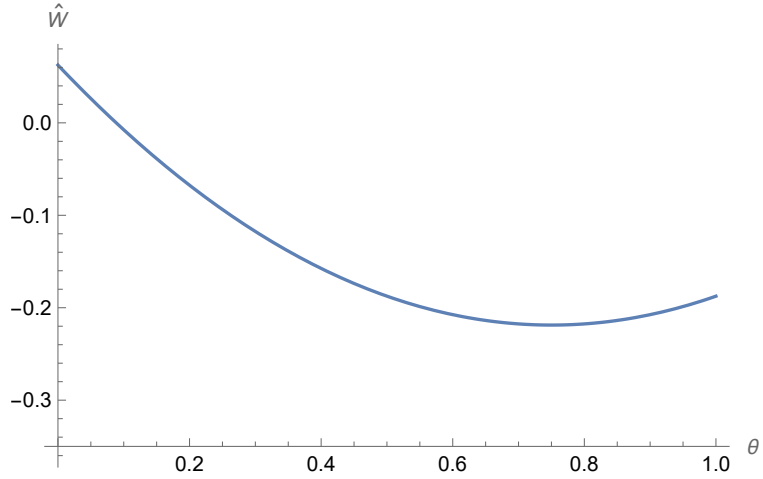
Examples: demotivating beliefs and subjective wellbeing

Figure A1: Plot of subjective well-being $\hat{W}$ on the intensity of demotivating beliefs θ, for $\alpha = 1/2$, $A = 1$, and a population-average belief $\sum_{k=1}^{n} q_k \theta_k = \sigma\alpha$.

(a) $\sigma = 0.25$



(b) $\sigma = 0.5$



Looking across groups

- So far, we have considered types **within** a single population characterized by a fixed degree of zero-sumness, α.
- We now consider variation **between** populations.
  - Assume a finite set of groups, $k \in \{1, 2, \ldots, K\}$, each with its own degree of zero-sumness, α^k.
  - Boundaries of groups potentially shaped by: location, industry/occupation of employment, social networks, economic class, age, gender, ethnicity, etc.
- Assume each group has the same degree of positive sorting σ and set of potential beliefs Θ.
- The mean demotivating belief of group k is:

$$\overline{\theta}^k = \sum_{i=1}^{n} q_i \, \theta_i.$$

Looking across groups

Zero sum $\alpha^k \Rightarrow$ Mean demotivating belief $\overline{\theta}^k$

Proposition 4:

- Looking across groups, as long as enough time has passed, then the mean **strength of demotivating beliefs $\overline{\theta}^k$ is increasing in the degree of zero-sumness α^k.**

Looking across groups

Zero-sum $\alpha^k \Rightarrow$ Mean effort $\overline{x}^k$, Mean material welfare $\overline{W}^k$

Proposition 5:

- Looking across groups, as long as enough time has passed, then average **effort $\overline{x}^k$ and material welfare $\overline{W}^k$ are both decreasing in the degree of zero-sumness α^k.**

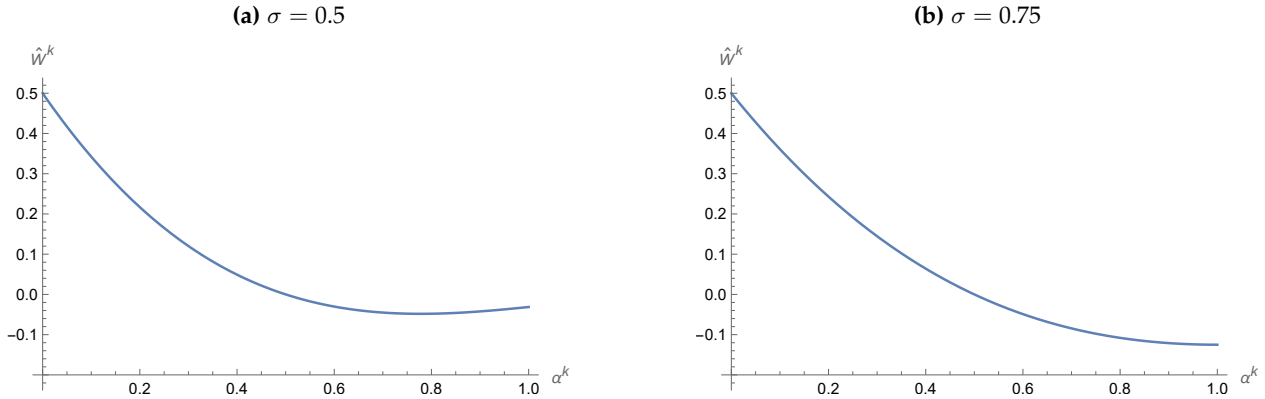
Looking across groups

$\alpha^k \Rightarrow$ Mean subjective wellbeing $\overline{\hat{W}}^k$

Proposition 6:

- Looking across groups, as long as enough time has passed, then average **subjective wellbeing $\overline{\hat{W}}^k$ is (generally) decreasing in the degree of zero-sumness α^k.**

Figure A2: Plot of subjective well-being $\hat{W}^k$ on the degree to which the environment is zero-sum α^k, when $A = 1$ and all individuals hold the limiting belief $\theta^* = \sigma\alpha^k$.



Looking across groups

Demotivating beliefs $\overline{\theta}^k \Rightarrow$ Mean effort $\overline{x}^k$, material welfare $\overline{W}$, subjective wellbeing $\overline{\hat{W}}^k$

Corollary 2 (follows from Props 4, 5, & 6):

- Looking across groups, as long as enough time has passed, then average **effort $\overline{x}^k$, material welfare $\overline{W}^k$, and subjective wellbeing $\overline{\hat{W}}^k$ are all decreasing in the average strength of demotivating beliefs $\overline{\theta}^k$.**

Empirical analysis

1. Developing society (along the lines considered by Foster).
   - Primary data collection in the Dem. Rep. of the Congo.
   - Two samples: 200-person from 2015 and 1,000-person from 2019.
   - From the city of Kanaga, a recently-created, now regional capital, with a primarily-immigrant population of roughly 1.8 million.

2. Industrialized global sample (arguably beyond what Foster had in mind).
   - From the World Values Surveys (WVS).
   - Provides a large enough sample (approx. 250,000) to test all propositions of the model.

Empirical challenges

1. Identifying groups k in the sample.
   - We do not observe the boundaries of groups.
   - Only observe individuals who may or may not be drawn from the same groups.
   - Examine variation across individuals while checking the sensitivity of findings to different assumptions of non-independence of observations.

2. Measuring the degree of zero-sumness α^k.
   - It is hard to measure how zero-sum the world is.
   - However, can measure a respondent's perceived zero-sumness of their world.

Measuring zero-sum in the DRC

Respondents report the extent to which they agree with two opposing statements. For example:

> Statement 1: "If one person in a village gets very wealthy, other people in the village will become poorer."
>
> Statement 2: "If one person in a village gets very wealthy, other people in the village will not necessarily become poorer."

Choose one of the following responses.

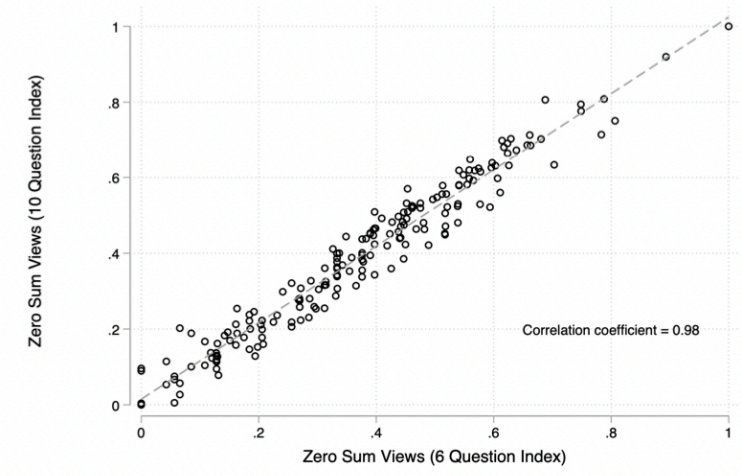
- Agree strongly with statement 1
- Agree with statement 1
- Agree with statement 2
- Agree strongly with statement 2

Zero-sum questions and principal components analysis

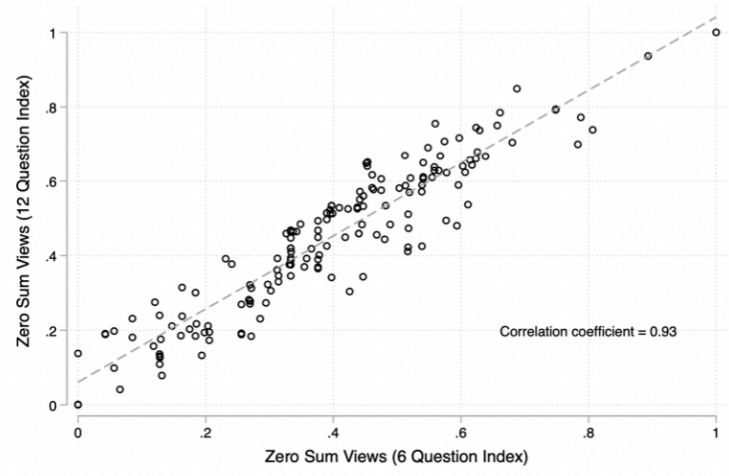
Zero-sum survey questions	(1) 6 question index (200 sample)	(2) 6 question index (1,000 sample)	(3) 10 question index (200 sample)	(4) 12 question index (200 sample)
1. In Kananga, people only make money when others lose money 2. In Kananga, no one need lose money for others to make money	0.467	0.469	0.434	0.392
1. In Kananga, businesses only make money when others lose money 2. In Kananga, no one need lose money for businesses to make money	0.400	0.471	0.381	0.368
1. If one person in a village gets very wealthy, other people in the village will become poorer 2. If one person in a village gets very wealthy, other people in the village will not necessarily become poorer	0.320	0.378	0.306	0.240
1. In trade, if one party gains the other party loses 2. In trade, it is possible for both parties to gain at the same time	0.325	0.413	0.289	0.229
1. A person can only gain power by taking it away from others 2. A person can gain power without taking it away from others	0.453	0.362	0.451	0.434
1. Gaining happiness requires taking it away from others. 2. It is possible for everyone to be happy	0.456	0.336	0.436	0.426
1. If one farmer has a huge crop, his neighbor is likely to also have a huge crop. 2. If one farmer has a huge crop, his neighbor is likely to have a small crop.			0.277	0.302
1. The success of the wealthy generally helps other people in the community 2. The success of the wealthy generally hurts other people in the community			0.127	0.216
1. Most wealth is created without exploiting others 2. Most wealth is obtained by exploiting others			0.049	0.135
1. Most of the wealth of the rich was created without taking it from others 2. Most of the wealth of the rich was obtained by taking it from others			-0.032	0.009
1. If God is looking out for my brother, He is less likely to be looking out for me 2. If God is looking out for my brother, He is more likely to also be looking out for me				0.258
1. If my ancestors' spirits are looking out for my brother, they are less likely to be looking out for me 2. If my ancestors' spirits are looking out for my brother, they are more likely to also be looking out for me				0.093
Eigenvalue	2.067	2.169	2.209	2.272
Observations	205	984	193	163

Correlations between zero-sum indices

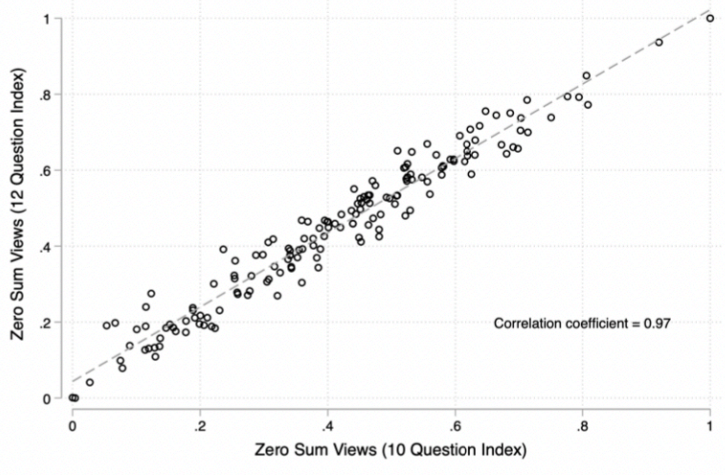
(a) Zero-Sum View Indexes: 6 Questions vs. 10 Questions



(b) Zero-Sum View Indexes: 6 Questions vs. 12 Questions

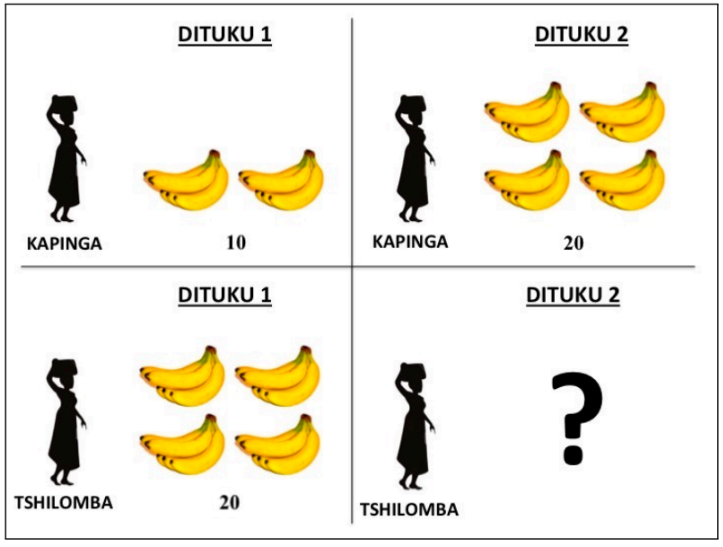


(c) Zero-Sum View Indexes: 10 Questions vs. 12 Questions

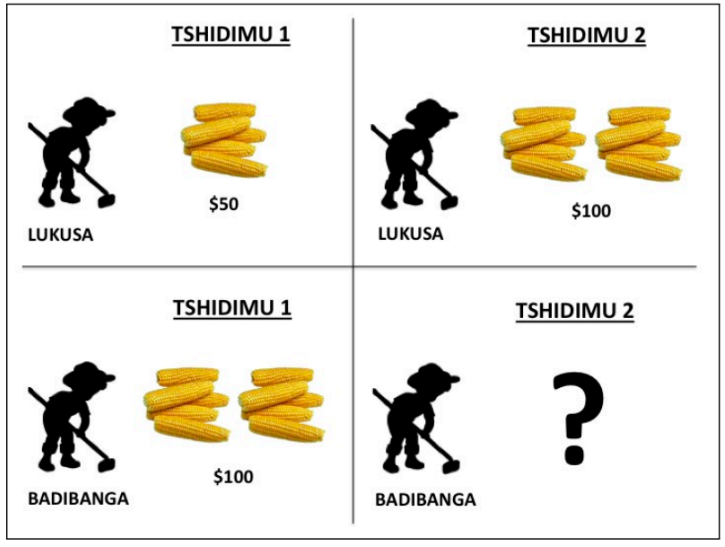


Validation of the zero-sum indices

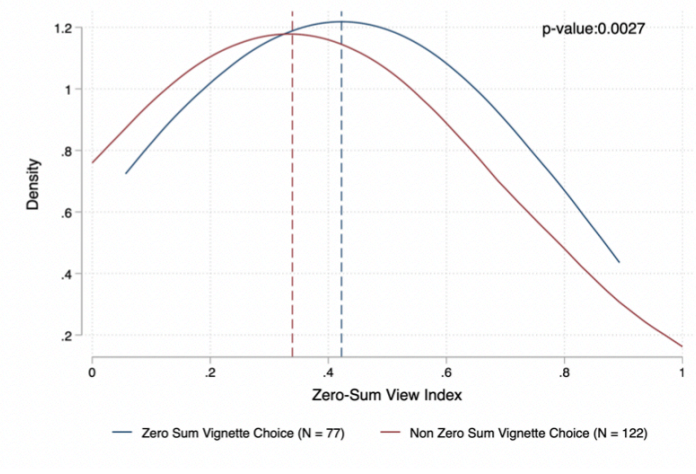
(a) Banana vignette: 10 or 40 bananas?



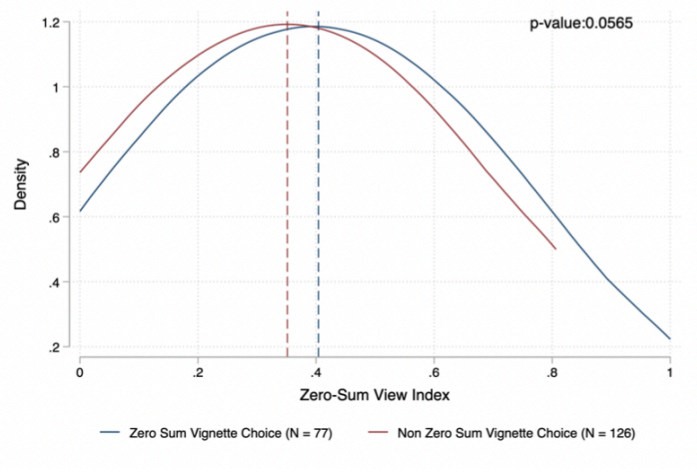
(b) Maize vignette: $50 or $200 of corn?



(c) Banana vignette



(d) Maize vignette



Measuring envy

Statements:

1. "It is so frustrating to see some people succeed so easily."
2. "It somehow doesn't seem fair that some people seem to have all the talents."
3. "Frankly, the success of my neighbors makes me resent them."
4. "I sometimes wish that rich and powerful people lose their advantage."

Choices:

1 strongly disagree; 2 moderately disagree; 3 slightly disagree; 4 slightly agree; 5 moderately agree; 6 strongly agree.

Envy questions and principal components analysis

Envy survey questions	(1) 200 sample	(2) 1,000 sample
It is frustrating to see some people succeed in life easily	0.547	0.509
It is not fair that some people seem to have all the talent	0.347	0.475
The success of my neighbors makes me resent them	0.544	0.509
I sometimes wish that rich and powerful people lose their advantage	0.532	0.506
Eigenvalue	2.046	2.406
Observations	224	1,020

Traditional religious belief questions

Questions:

1. "What is the strength of your belief in the existence of other gods and spirits, including ancestor spirits?"

   1 With no strength at all; 2 With a little bit of strength; 3 With strength; 4 With a lot of strength; 5 With all my heart.

2. "How often do you pray to other gods and spirits including ancestor spirits?"

   1 never; 2 very rarely; 3 a few times per year; 4 a few times per month; 5 a few times per week.

3. "How often do you participate in rituals devoted to other gods and spirits, including ancestor spirits?"

   1 never; 2 very rarely; 3 a few times per year; 4 a few times per month; 5 a few times per week.

4. "Using the figures provided, which set of figures best represents how close you feel to non-Christians in Kananga?"

Traditional religion questions and principal components analysis

Witchcraft survey questions	(1) 200 sample	(2) 1,000 sample
Aside from the Christian God, what is the strength of your belief in the existence of other gods and spirits, including ancestor spirits?	0.436	0.569
How often do you pray to gods and spirits other than the Christian God (including ancestor spirits)?	0.600	0.584
How often do you attend rituals devoted to gods and spirits other than the Christian God (including ancestor spirits)?	0.586	0.579
Using the figures provided, which set of figures best represents how close you feel to pagans in Kananga?	0.326	0.010
Eigenvalue	2.416	2.640
Observations	217	1,020

Christian belief questions

Questions:

1. "What is the strength of your belief in the existence of the Christian God?"

   1 With no strength at all; 2 With a little bit of strength; 3 With strength; 4 With a lot of strength; 5 With all my heart.

2. "How often do you pray the Christian God or Jesus?"

   1 never; 2 very rarely; 3 a few times per year; 4 a few times per month; 5 a few times per week.

3. "How often do you attend church?"

   1 never; 2 very rarely; 3 a few times per year; 4 a few times per month; 5 a few times per week.

4. "Using the figures provided, which set of figures best represents how close you feel to Christians in Kananga?"

Christianity questions and principal components analysis

Christianity survey questions	(1) 200 sample	(2) 1,000 sample
What is the strength of your belief in the existence of the Christian God?	0.543	0.463
How often do you pray to the Christian God or Jesus?	0.643	0.630
How often do you attend church or other communal religious rituals?	0.437	0.600
Using the figures provided, which set of figures best represents how close you feel to devout Christians Kananga?	0.317	0.167
Eigenvalue	1.869	1.423
Observations	217	1,020

Zero-sum and demotivating beliefs: 200-person sample

	Dependent Variable: Principal-Component Based Measures of:							
	Envy of Others Success		Witchcraft Beliefs		Christianity Beliefs		Difference Between Witchcraft & Christianity	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Zero-sum thinking, 0-1	0.333***	0.349***	0.319***	0.276**	-0.146**	-0.147**	0.465***	0.423***
	(0.064)	(0.076)	(0.092)	(0.089)	(0.065)	(0.068)	(0.122)	(0.121)
Gender, age, age squared	Y	Y	Y	Y	Y	Y	Y	Y
Ethnicity FEs	N	Y	N	Y	N	Y	N	Y
Observations	204	204	197	197	197	197	197	197
R squared	0.117	0.164	0.072	0.127	0.034	0.096	0.067	0.140

Zero-sum and demotivating beliefs: 1000-person sample

	Dependent Variable: Principal-Component Based Measures of:							
	Envy of Others' Success		Witchcraft Beliefs		Christianity Beliefs		Difference Between Witchcraft & Christianity	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Zero-sum thinking, 0-1	0.158***	0.155***	0.038	0.037	-0.050**	-0.051**	0.088**	0.088**
	(0.026)	(0.026)	(0.027)	(0.027)	(0.016)	(0.016)	(0.033)	(0.034)
Gender, age, age squared	Y	Y	Y	Y	Y	Y	Y	Y
Ethnicity FEs	N	Y	N	Y	N	Y	N	Y
Observations	984	984	984	984	984	984	984	984
R squared	0.047	0.053	0.017	0.022	0.009	0.016	0.016	0.022

Measuring zero-sum (in the World Values Survey)

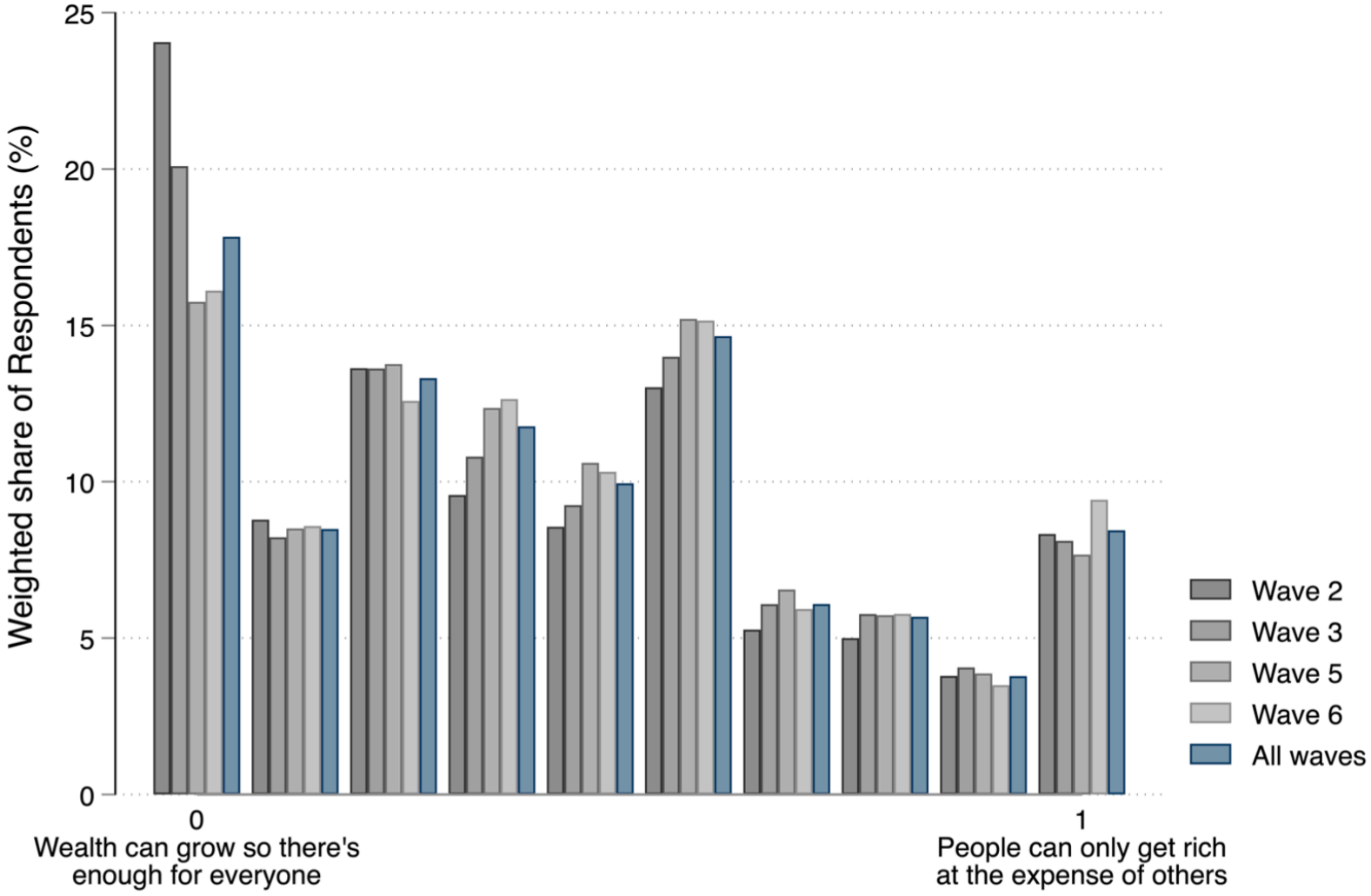
Respondents choose the extent to which they agree with the following opposite statements.

> Statement 1 (value 1): "Wealth can grow so there's enough for everyone."
>
> Statement 2 (value 10): "People can only get rich at the expense of others."

Choose an integer on a 10-point scale.

- We normalize to lie between zero and one.
- See Chinoy et al. (2023) for validation of the measure.

Distribution of zero-sum perceptions in the WVS



The consequences of zero-sum thinking

$$Y_{i,c,t} = \alpha_{c,t} + \beta \, \text{Zero Sum}_{i,c,t} + \mathbf{X}_{i,c,t}\boldsymbol{\Gamma} + \varepsilon_{i,c,t}$$

- i indexes individuals, c countries, and t the survey year.
- $\alpha_{c,t}$ are country-by-survey-wave fixed effects.
- $\mathbf{X}_{i,c,t}$ includes: gender, age, age squared and interactions.
- $Y_{i,c,t}$ is an outcome of interest.
  - Demotivating beliefs, θ
    - Proposition 4: $\alpha \Rightarrow \theta$
  - Education, savings, occupation, income, x, W
    - Proposition 5: $\alpha \Rightarrow x, W$
    - Corollary 2a: $\theta \Rightarrow x, W$
  - Life satisfaction / happiness, $\hat{W}$
    - Proposition 6: $\alpha \Rightarrow \hat{W}$
    - Corollary 2b: $\theta \Rightarrow \hat{W}$

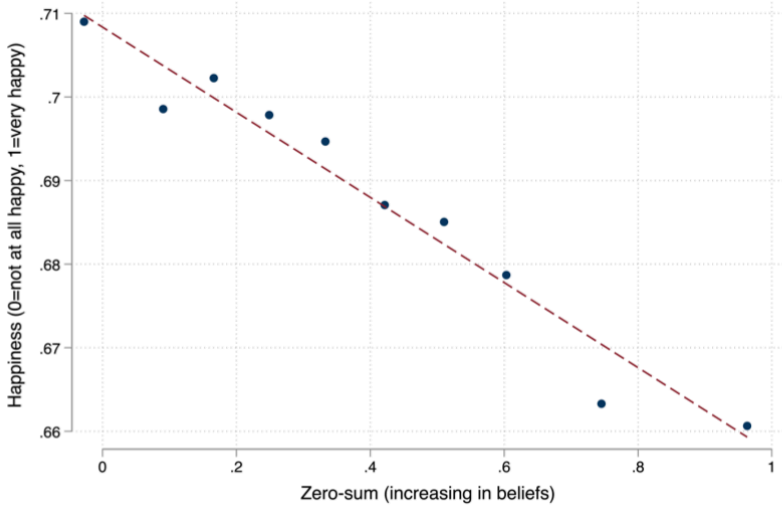
Demotivating beliefs (Prop 4):
$\alpha \Rightarrow \theta$

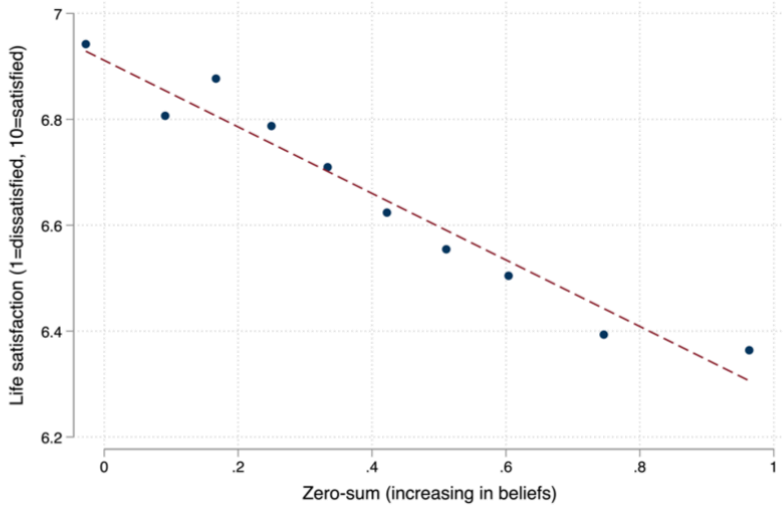
	Dependent Variable: Demotivating Belief:					
	Hard work brings success, 0 = fully agree to 1 = fully disagree	People are poor because of laziness, 0 = agree or 1 = disagree	People have a chance to escape poverty, 0 = agree or 1 = disagree	Humiliating to receive money without working for it, 0 = strongly agree to 1 = strongly disagree	Important to me to be successful, 0 = very much to 1 = not at all	How important is work, 0 = very important to 1 = not at all
	(1)	(2)	(3)	(4)	(5)	(6)
Zero-sum thinking, 0-1	0.112***	0.077***	0.121***	0.023***	0.024***	0.034***
	(0.002)	(0.006)	(0.006)	(0.004)	(0.002)	(0.002)
Demographic controls	Y	Y	Y	Y	Y	Y
Wave-country FE	Y	Y	Y	Y	Y	Y
Observations	246,408	55,871	59,052	60,856	151,270	242,255
R-squared	0.121	0.125	0.178	0.096	0.171	0.111
Mean dependent variable	0.363	0.697	0.602	0.352	0.391	0.162
Std. dev. dependent variable	0.321	0.459	0.489	0.296	0.290	0.248
Mean independent variable	0.406	0.393	0.394	0.406	0.416	0.407
Std. dev. independent variable	0.309	0.317	0.315	0.297	0.305	0.309

Economic outcomes (Prop 5):
$\alpha \Rightarrow x^*, W$

	Dependent Variable: Measures of Economic Welfare:					
	Income decile, 0 = bottom decile to 1 = top decile	Family savings, 0=borrowed to 1=saved	Educational attainment, 0 = primary school or less to 1 = university or more	Cognitive vs. manual work tasks, 0=manual to 1 = cognitive	Supervising someone at work, 0=no to 1=yes	Class, 0 = lower class to 1 = upper class
	(1)	(2)	(3)	(4)	(5)	(6)
Zero-sum thinking, 0-1	-0.039***	-0.032***	-0.030***	-0.049***	-0.046***	-0.045***
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)	(0.002)
Demographic controls	Y	Y	Y	Y	Y	Y
Wave-country FE	Y	Y	Y	Y	Y	Y
Observations	229,719	203,716	219,524	116,885	119,888	207,165
R-squared	0.159	0.090	0.173	0.087	0.106	0.111
Mean dependent variable	0.407	0.625	0.522	0.446	0.327	0.421
Std. dev. dependent variable	0.257	0.309	0.337	0.346	0.469	0.245
Mean independent variable	0.404	0.406	0.406	0.416	0.415	0.409
Std. dev. independent variable	0.309	0.308	0.309	0.301	0.302	0.307

Subjective wellbeing (Prop 6):
$\alpha \Rightarrow \hat{W}$





Happiness (Prop 6 & Corr 2):

$\alpha \Rightarrow \hat{W}$; $\theta \Rightarrow \hat{W}$

	Dependent Variable: Self-Reported Happiness, 0-1						
		Measure of demotivating beliefs used:					
		Hard work brings success, 0 = fully agree to 1 = fully disagree	People are poor because of laziness, 0 = agree or 1 = disagree	People have a chance to escape poverty, 0 = agree or 1 = disagree	Humiliating to receive money without working for it, 0 = strongly agree to 1 = strongly disagree	Important to me to be successful, 0 = very much to 1 = not at all	How important is work, 0 = very important to 1 = not at all
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Zero-sum thinking, 0-1	-0.051***						
	(0.002)						
Demotivating belief, θ		-0.046***	-0.045***	-0.043***	-0.019***	-0.045***	-0.038***
		(0.001)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Demographic controls	Y	Y	Y	Y	Y	Y	Y
Wave-country FE	Y	Y	Y	Y	Y	Y	Y
Observations	246,094	329,899	62,055	64,833	103,517	156,835	398,525
R-squared	0.145	0.136	0.187	0.181	0.105	0.123	0.134
Mean dependent variable	0.688	0.694	0.653	0.653	0.696	0.707	0.692
Std. dev. dependent variable	0.249	0.246	0.255	0.254	0.243	0.244	0.248
Mean independent variable	0.405	0.365	0.701	0.599	0.346	0.394	0.159
Std. dev. independent variable	0.309	0.323	0.458	0.490	0.296	0.292	0.247

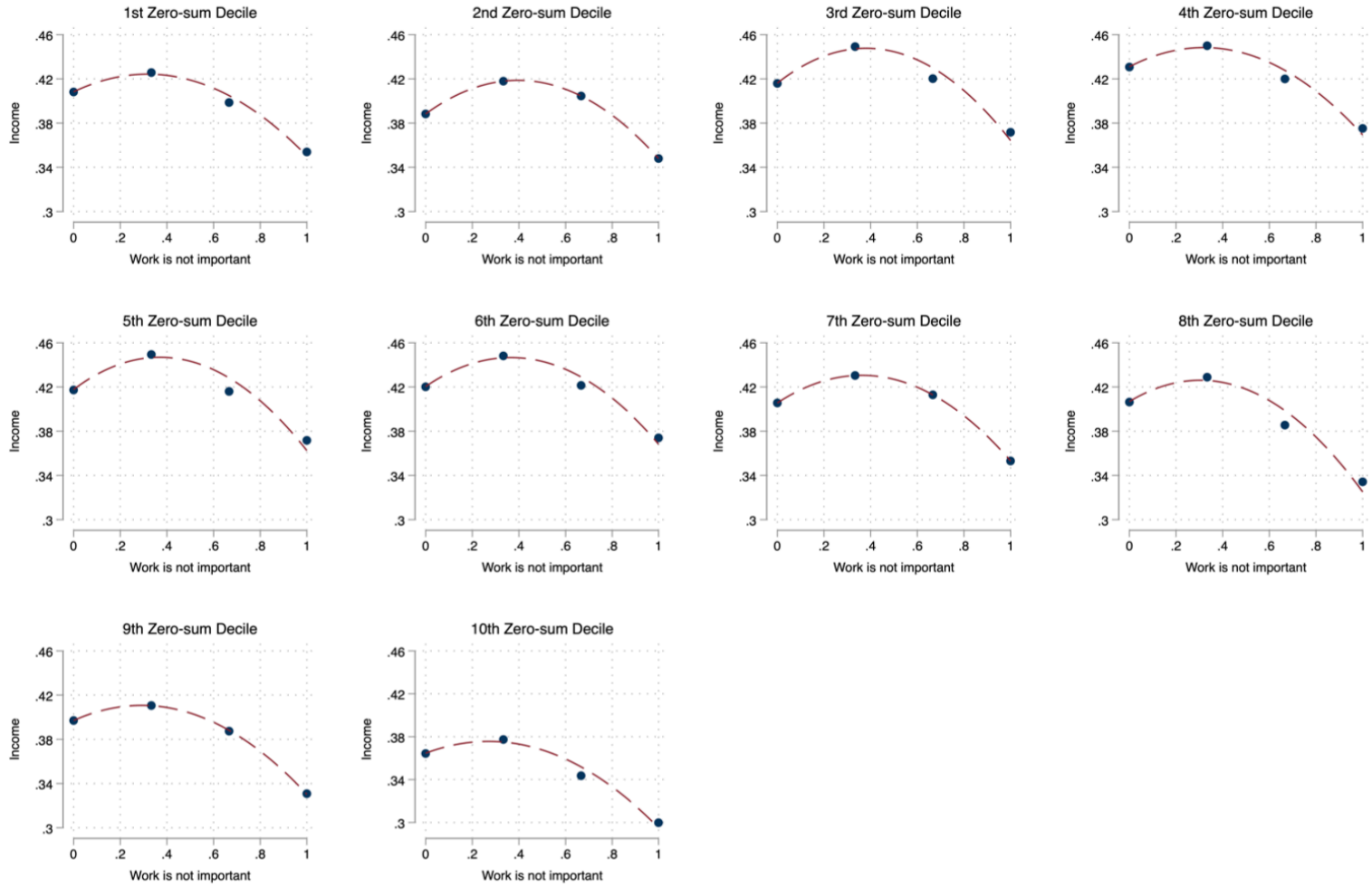
Life satisfaction (Prop 6 & Corr 2): $\alpha \Rightarrow \hat{W}$; $\theta \Rightarrow \hat{W}$

	Dependent Variable: Subjective Life Satisfaction, 1-10						
		Measure of demotivating beliefs used:					
		Hard work brings success, 0 = fully agree to 1 = fully disagree	People are poor because of laziness, 0 = agree or 1 = disagree	People have a chance to escape poverty, 0 = agree or 1 = disagree	Humiliating to receive money without working for it, 0 = strongly agree to 1 = strongly disagree	Important to me to be successful, 0 = very much to 1 = not at all	How important is work, 0 = very important to 1 = not at all
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Zero-sum thinking, 0-1	-0.628***						
	(0.016)						
Demotivating belief, θ		-0.474***	-0.622***	-0.551***	-0.226***	-0.525***	-0.252***
		(0.013)	(0.022)	(0.020)	(0.025)	(0.021)	(0.015)
Demographic controls	Y	Y	Y	Y	Y	Y	Y
Wave-country FE	Y	Y	Y	Y	Y	Y	Y
Observations	245,792	329,770	60,594	64,415	103,372	157,059	400,198
R-squared	0.173	0.164	0.246	0.242	0.167	0.132	0.172
Mean dependent variable	6.656	6.746	6.177	6.205	6.582	6.791	6.667
Std. dev. dependent variable	2.382	2.360	2.626	2.600	2.400	2.278	2.416
Mean independent variable	0.406	0.366	0.705	0.600	0.347	0.395	0.159
Std. dev. independent variable	0.310	0.323	0.456	0.490	0.296	0.292	0.247

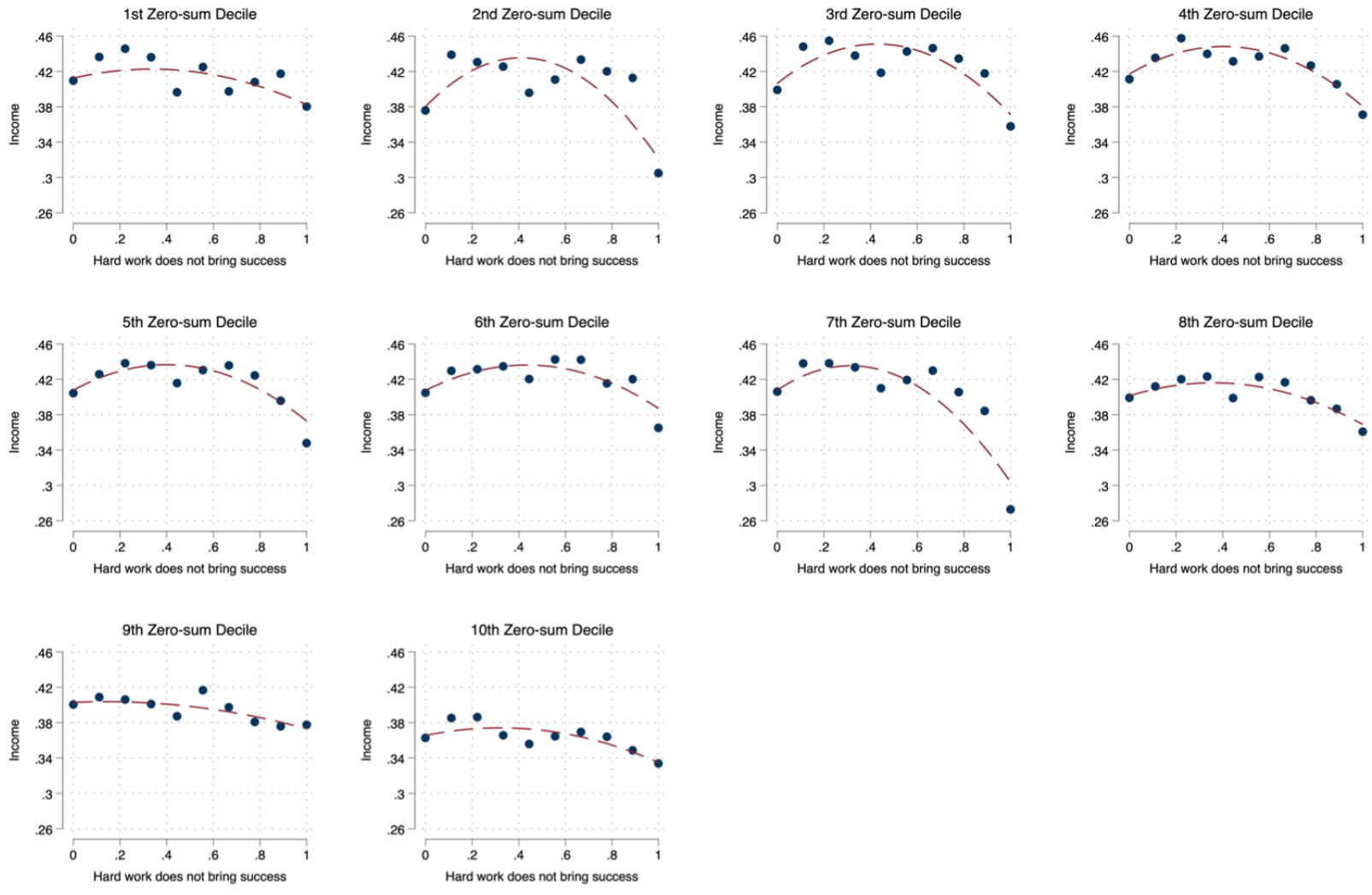
Across groups vs. within groups

- Propositions 4–6 (and corollary 2) are relevant for variation across groups (with different α's).
- Now turn to Propositions 1–3 which consider variation within groups (with the same α).
- Divide sample into deciles based on self-reported zero-sum perceptions.
  1. Unconditional.
  2. Conditional on survey wave by country FEs.
  3. Conditional on demographic controls (age, gender, interactions).
  4. Conditional on FEs and demographics. (*)

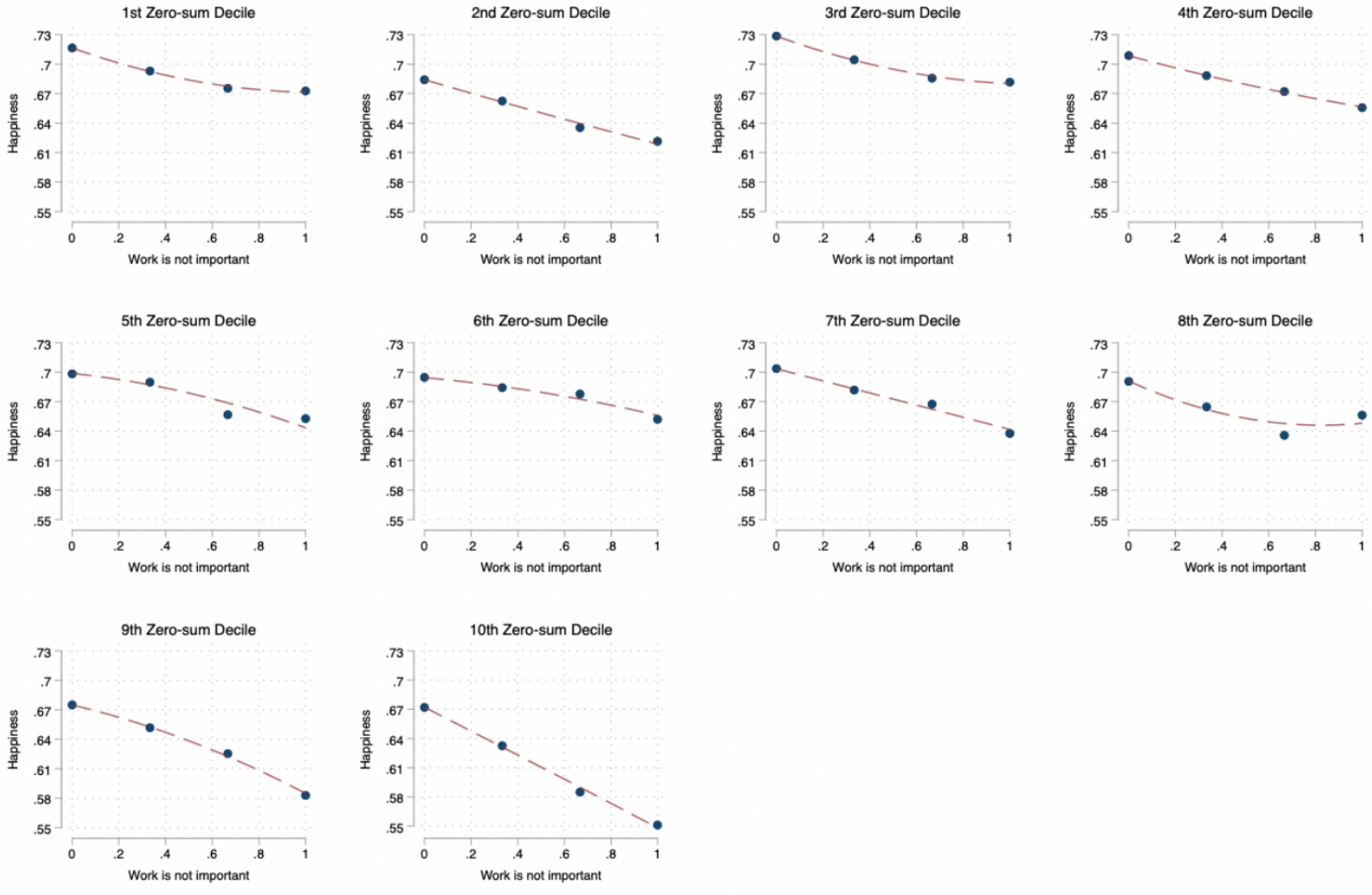
Demotivating belief and income (Prop 2): Fix $\alpha; \theta \Rightarrow W$



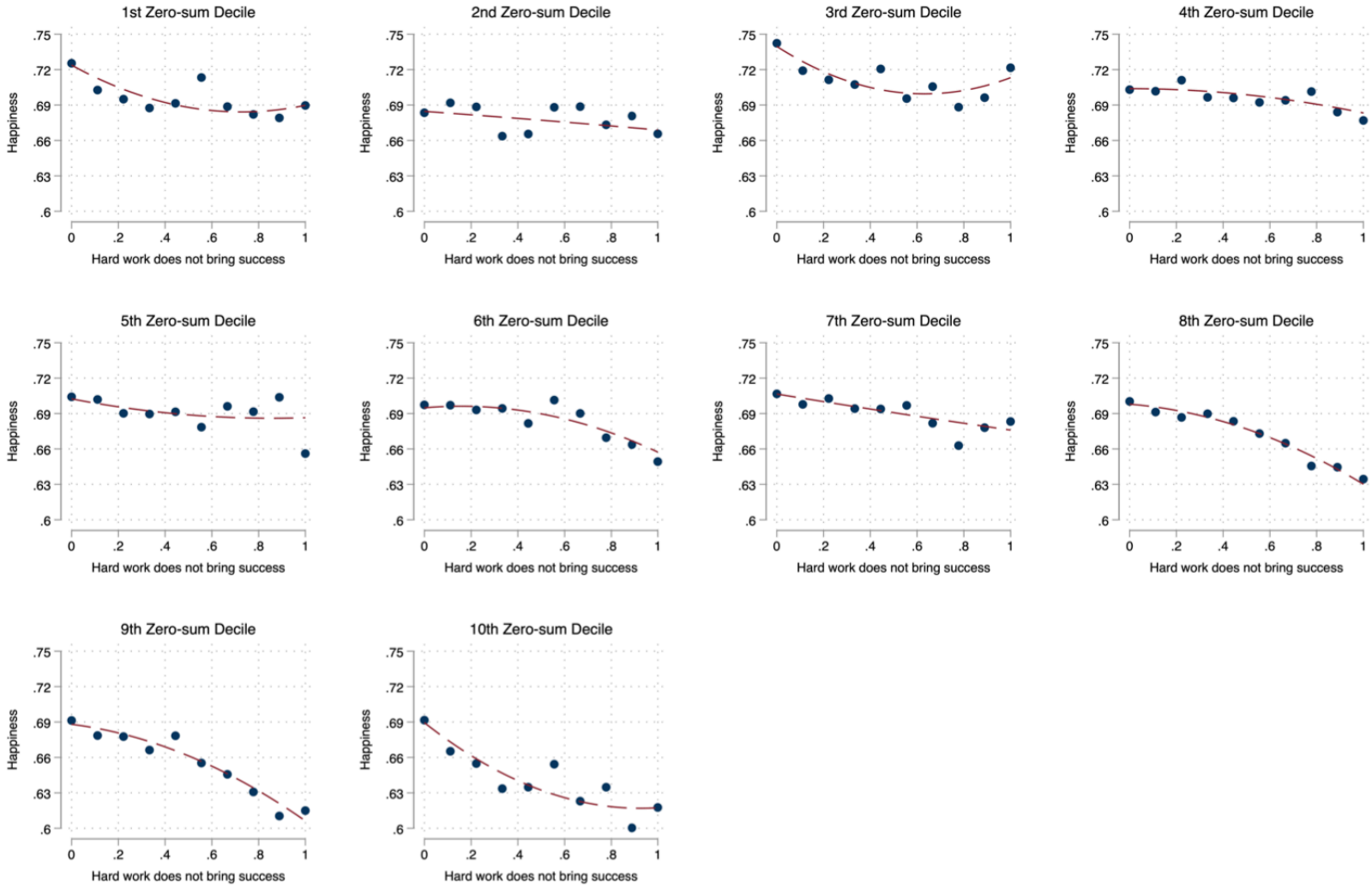
Demotivating belief and income (Prop 2): Fix $\alpha; \theta \Rightarrow W$



Demotivating beliefs and happiness (Prop 3): Fix $\alpha; \theta \Rightarrow \hat{W}$



Demotivating beliefs and happiness (Prop 3): Fix $\alpha; \theta \Rightarrow \hat{W}$

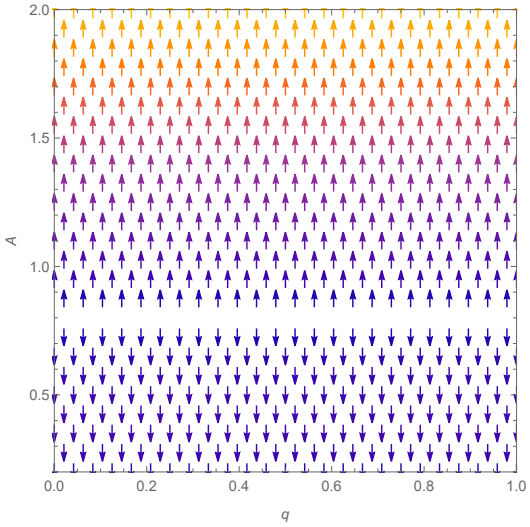


Introducing technology and economic growth

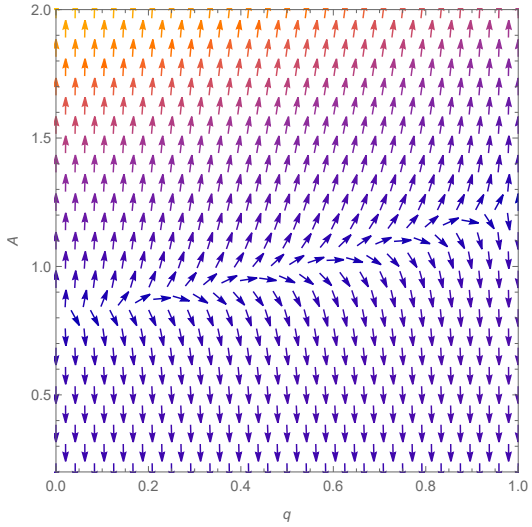
- Assume a baseline (minimum) level of technology $\underline{A}$.
- Above this, technology depreciates by $\delta \in (0, 1)$ each period.
- Technological growth, $\dot{A}$, is increasing in the average level of effort in society, $\overline{x}(\mathbf{q}, A)$.
- Thus, technology evolves according to:

$$\dot{A} = \overline{x}(\mathbf{q}, A) - \delta A$$

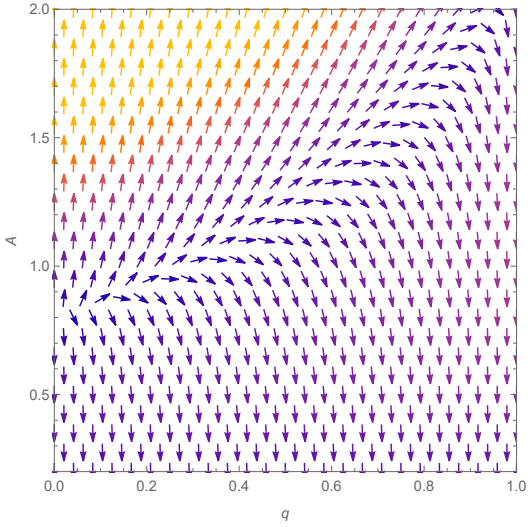
Dynamics of beliefs q and technology A: Varying θ for a fixed α



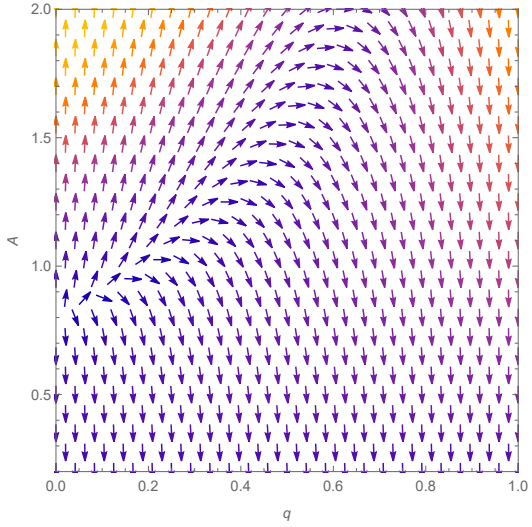
(a) $\theta = 0$



(b) $\theta = 0.2$



(c) $\theta = 0.4$



(d) $\theta = 0.8$

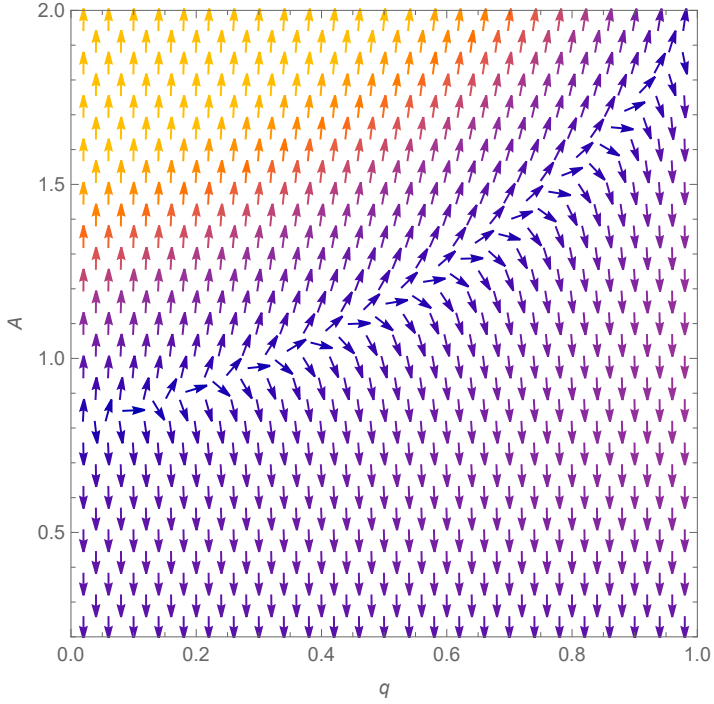
On the rise of Western Europe

- Columbian exchange, global trade, and colonial rule resulted in a world that was less zero-sum for European nations.
  - Wealth outside of Europe allowed those within Europe to gain.
- At the same time, there was a decline in demotivating values and new values that were 'motivating':
  - 'Bourgeois virtues' (McCloskey, 2006)
  - 'Spirit of capitalism' (Weber, 1930)
  - 'Need for achievement' (McClelland, 1961)
  - 'English individualism' (MacFarlane, 1978)
- A decline in α (and/or θ), even if temporary, could have lowered the development barrier, leading to sustained economic growth.

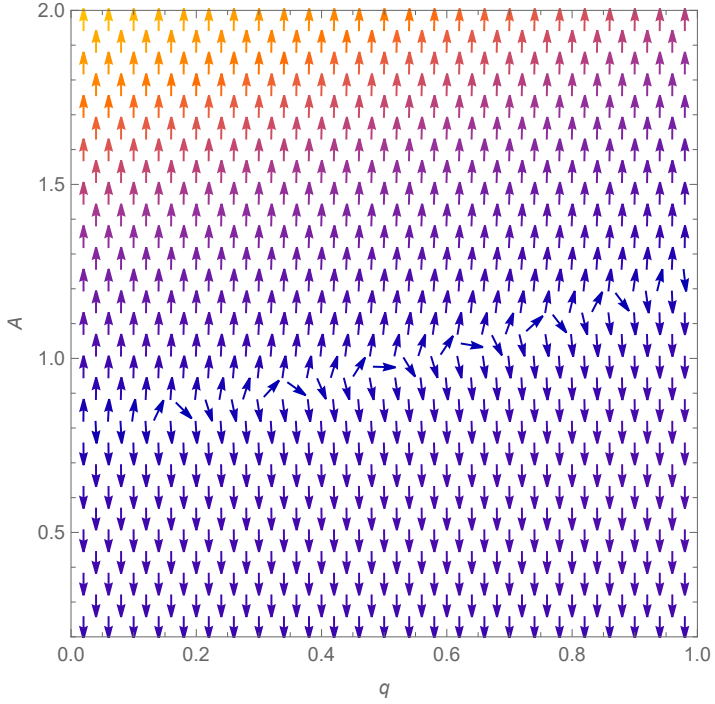
Dynamics of beliefs q and technology A: Varying α with $\theta = \sigma\alpha$

Figure 9: Vector plot of (q, A) under belief set $\Theta = \{0, \theta^*\}$, where q is the population share of the 'optimal' demotivating belief θ^*. Parameter values: $\sigma = 0.4$, $\delta = 0.8$, $\underline{A} = 0.2$.

(a) $\alpha = 0.9$, $\theta^* = 0.36$

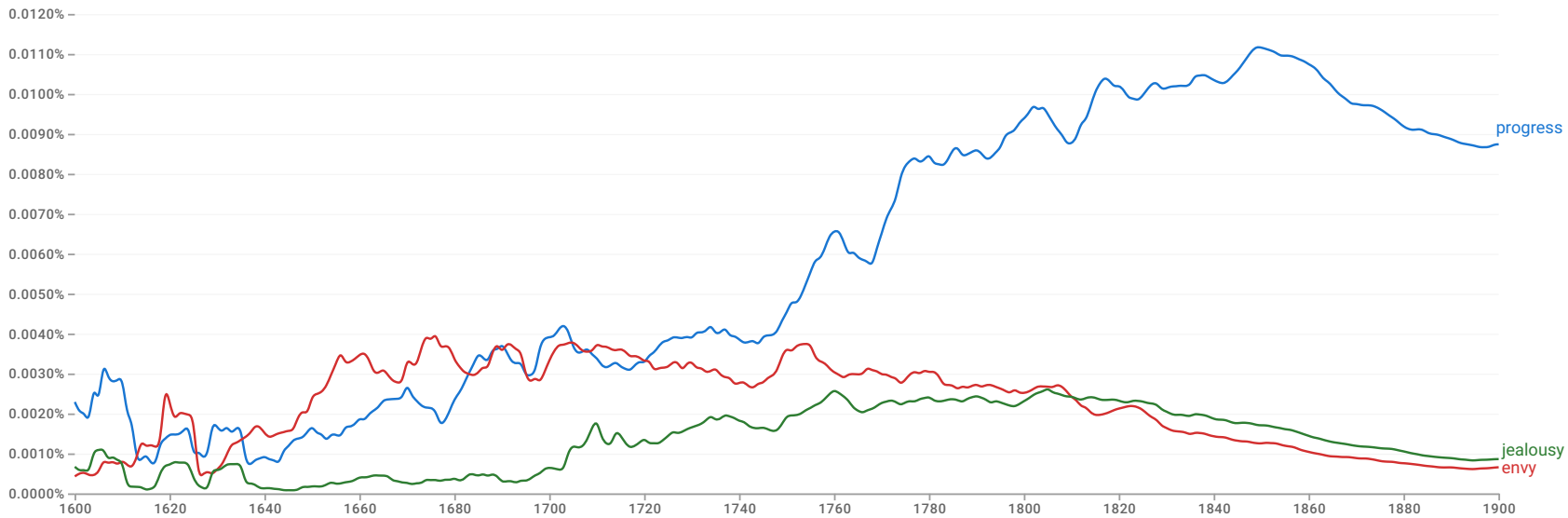


(b) $\alpha = 0.5$, $\theta^* = 0.2$



On the rise of Western Europe

Figure: Frequency of the words “progress,” “jealousy,” and “envy” from 1600 to 1900, from Google N grams.



Conclusions

- Foster argued that an 'image of limited good' and a zero-sum world view key to understanding smaller-scale pre-industrial societies.
- Provided a theoretical framework to understand the relationship between a zero-sum environment, demotivating beliefs, income, happiness, and sustained economic growth.
- Empirically examined the consequences of zero-sum thinking in the DRC and globally, testing the predictions of the theory.
  - Across groups, zero-sum thinking is associated with demotivating beliefs, less education, lower income, and lower happiness.
- Evidence suggests that zero-sum thinking is more broadly relevant than originally hypothesized by Foster.