Common Beliefs and Welfare

Opposite beliefs sharing a similar outcome

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Motivation: Trust as a belief

- Generalized trust is present in a wide variety of studies
- The interest is fostered by:

correlation with development, equity and/or efficiency

- Trust has been analyzed from:

economics, sociology and political science

- Nevertheless, its conceptual definition and causality channels offer wide spaces for debate and research

WVS Generalized Trust

- Generalized trust is usually surveyed through a dilemma regarding general social interactions.
- The World Values Survey (WVS) is the most frequent source (since 1981, more than 100 countries, 90 percent of world population)
- WVS Generalized trust question
  "Generally speaking, would you say that
  1. most people can be trusted
  2. you can never be too careful when dealing with others"

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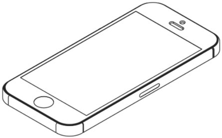

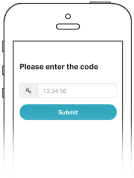

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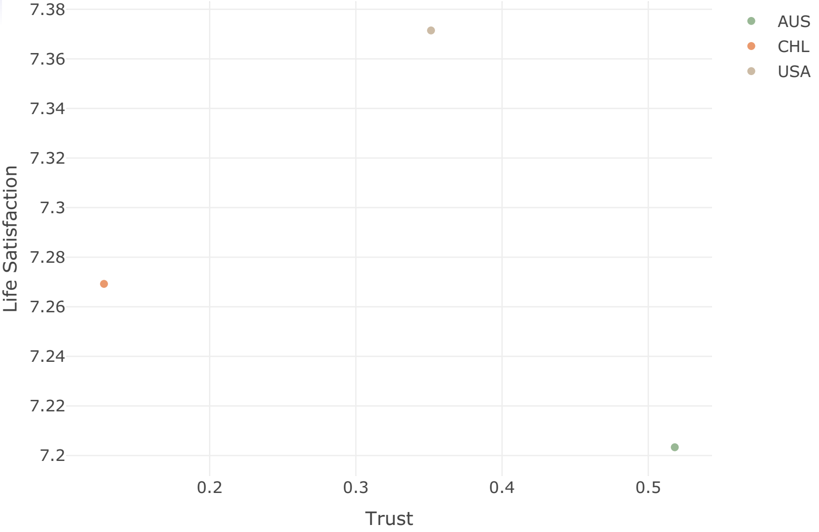

Interactive Figures: sebacea.shinyapps.io/CommonBeliefs

Comparability?

Example: WVS 2010-2014

AUS 46%	USA 39%	CHL 13%

- Are people in Australia answering about the same set of particular interactions than in Chile?
  - Available interactions might be different among societies.
  - Comparability issue

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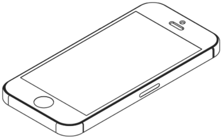

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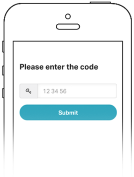

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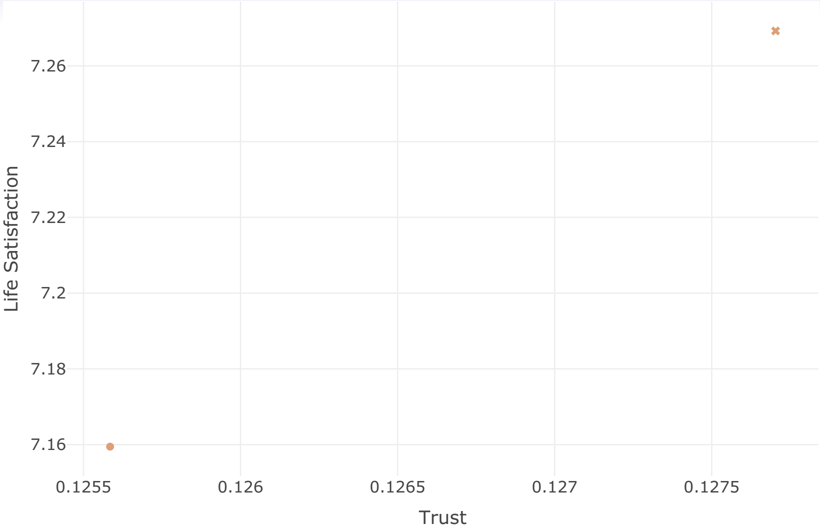


Figure 1: WV5 and 6 Life Satisfaction and Fairness in Chile

Our objective: to approach beliefs in Other People Behavior (OPB) through micro foundations and to

- understand how individuals decide whether to behave high or low output in anonymous interactions
- define OPB belief measure
- study the welfare impact of such measures
- asses comparability

Model

- We follow Zame (Ecma 2007), a general equilibrium model of firm formation
- We use a particular case of this configuration with endogenous anonymous interactions that consider explicitly incentives to trust or betray
    - there are two perfectly divisible commodities traded on competitive markets
    - many identical agents (in terms of preferences and endowments of the two commodities) and
    - a representative two-person generalized trust-interaction among individuals.

- The economy is endowed only with the first commodity:

  the agent's endowment is $e = (1, 0)$.

- The second commodity is produced through a 2-person trust-interaction using the first commodity as input

- Individuals decide whether to participate in this interaction and, if participating, there are two available actions: high (H) or low (B) output

- Set of available actions is

$$\mathbb{F} := \{(r, a) \in \{r_1, r_2\} \times \{H, L\}\} \cup \{0\},$$

  where $\{r_1, r_2\}$ stands for the symmetric roles and 0 for not participating

- In order to participate, each agent must invest her endowment of the first commodity to receive commodity 2
- Since the roles in the interaction are symmetric, the associated real-payoff of the interaction is given by half of the output generated
- Given an anonymous matching of two individuals willing to participate in the trust-interaction, there are 3 possible consequences:

Table 2: Real output of the interaction (in units of good 2).

	H	L
H	(C_g, C_g)	(C_m, C_m)
L	(C_m, C_m)	(C_b, C_b)

Proposition 1

There are two equilibria for each economy in $\mathcal{E}(C_m)$.

- In one equilibrium ("high-output") all agents participating in the interaction choose H and they are in proportion $\frac{C_m}{2+C_m}$.
- In the other equilibrium ("low-output") all agents in the interactions choose L, and participation is in proportion 0.5.

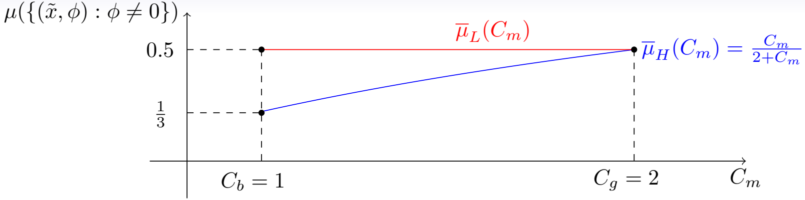
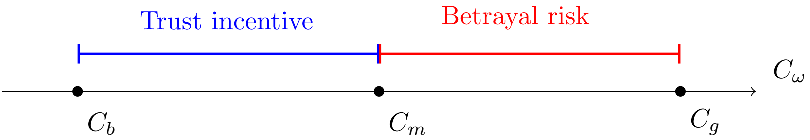
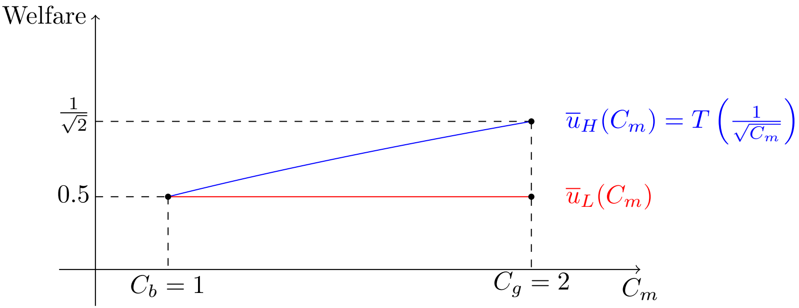


Figure 2: Relation between proportion of agents participating in the interaction and parameter C_m

Corollary

For economies $\mathcal{E}(C_m)$ with $C_m \in (1,2]$ and beliefs $\beta((H,H))=1$, a greater C_m induces more welfare and a higher proportion of people interacting.





Remark

For economies $\mathcal{E}(C_m)$ with $C_m \in (1, 2]$, equilibria are Pareto rankeable and, in particular, the equilibrium with beliefs $\beta((H, H)) = 1$ is a strict Pareto improvement with respect to the equilibrium with $\beta((L, L)) = 1$.

Mechanism

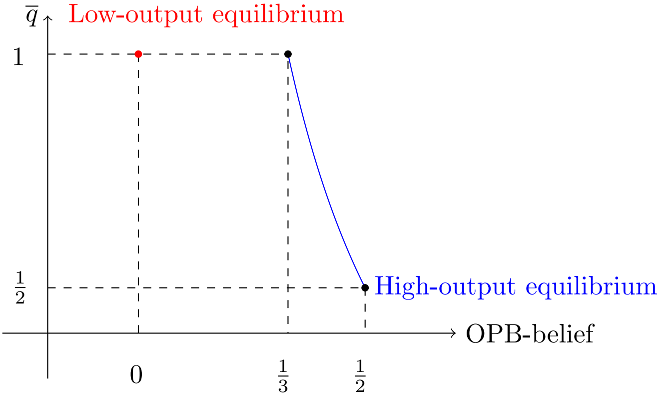


Figure 4: Relation between equilibrium price and OPB-beliefs in high-output equilibrium

Definition

For a given equilibrium $(\overline{q}, \overline{\beta}, \overline{\mu})$, a measure of the belief about Other People's Behavior (OPB-belief) is provided by proportion

$$\overline{\mu}(\{(\tilde{x}, \phi) : \phi_a = H\}).$$

Proposition

If OPB-belief increases, then welfare does not necessarily increase.

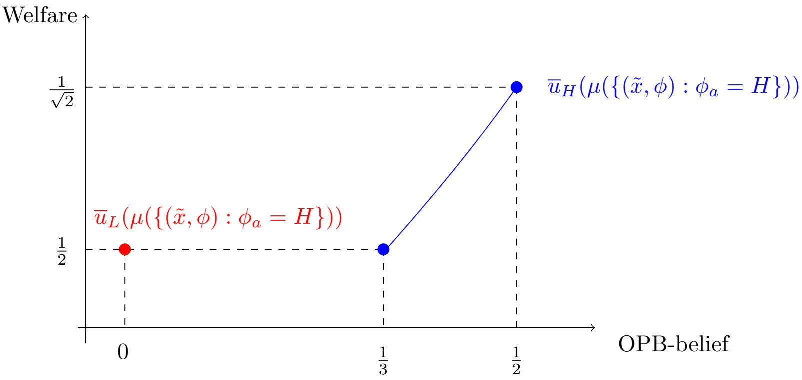


Figure 5: Relation between welfare and OPB-belief

Robustness

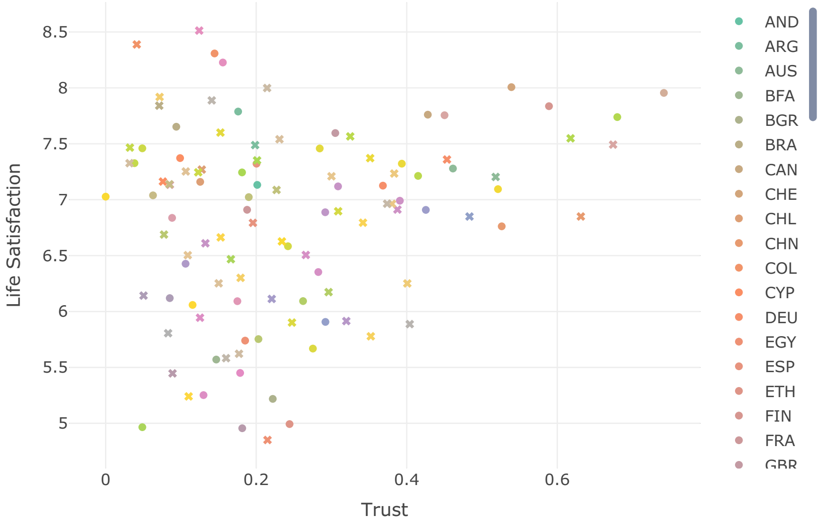


Figure 6: WV5-6 Life Satisfaction and Trust

- Welfare measure: Invariant Life Satisfaction across waves (19 countries) but significant change in
  - Trust: 14 countries or 73.7% of the sample
  - Fairness: 10 countries or 52.6%
- Different beliefs regarding Trust or Fairness share a similar Welfare-outcome!

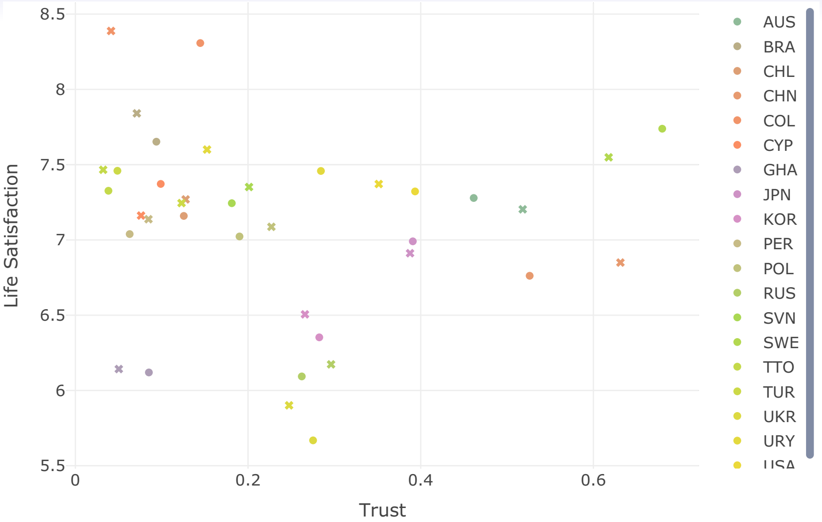


Figure 7: WV5-6 Life Satisfaction and Trust (welfare invariants)

Final Remarks

- Results do not depend on parametrization
- (Basic) Empirical robustness-check
- Preferences generalization
- To study the dynamics of the model

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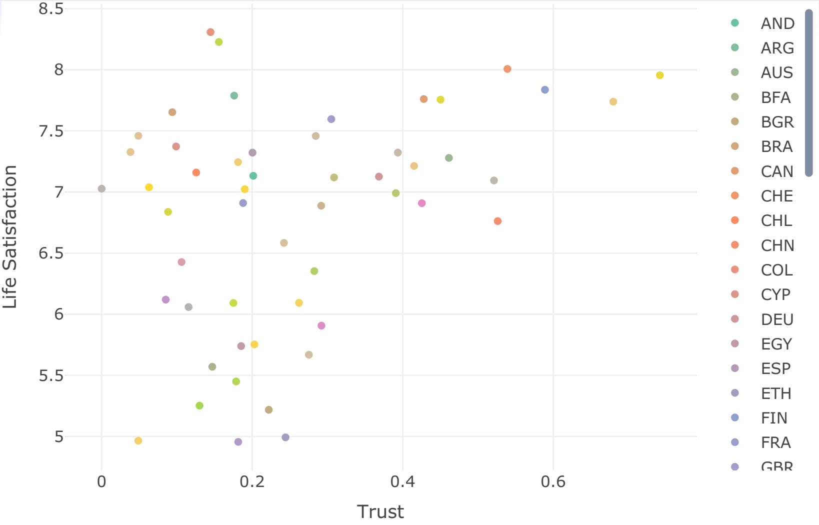

Figure 8: WV5 Life Satisfaction and Trust, $N = 51$

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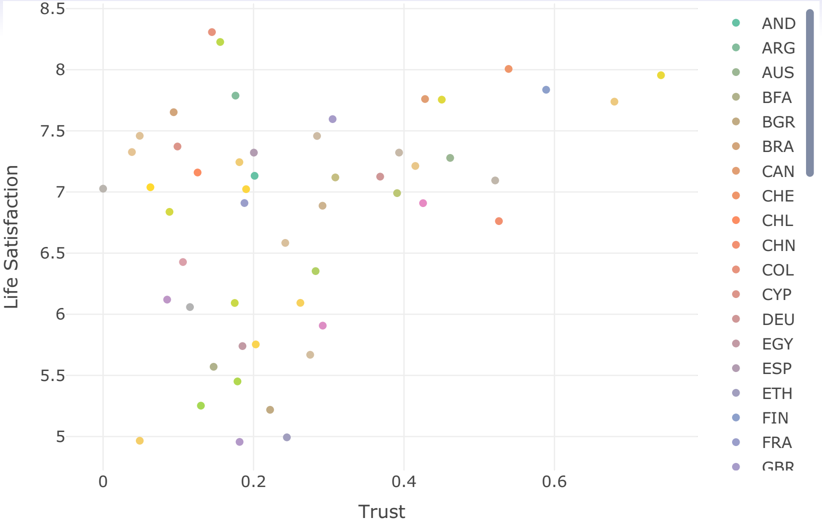

Figure 9: WV5 Life Satisfaction and Trust, $N = 51$

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- The set of consequences of the interaction is $\Omega = \{g, m, b\}$
- For the sake of notation, the per-capita technology of the interaction is denoted by $y(\omega) = (-1, C_\omega)$ for each $\omega \in \Omega$.
- Accordingly, $C_g \geq C_m \geq C_b$.

- There are conditional probabilities given by a function $\pi : \{H, L\} \times \{H, L\} \to \mathcal{P}(\Omega)$, where $\mathcal{P}(\Omega)$ is the space of probability measures on Ω
- A consumption decision is given by

$$\tilde{x} : \Omega \to \mathbb{R}^2_+,$$

where $\tilde{x}(\omega) = (x_1, x_2) \in \mathbb{R}^2_+$

- The choice set is defined by

$$X := \{(\tilde{x}, \phi) \in \mathbb{R}^{2|\Omega|} \times \mathbb{F} : \phi = 0 \quad \text{requires} \quad \tilde{x}(g) = \tilde{x}(m) = \tilde{x}(b)\},$$

since not participating is always an option, feasible consumption is independent of possible consequences when not interacting

- We normalize commodity prices with respect to good one so that the price of good two is denoted by $q \in \mathbb{R}_{++}$
- $(\tilde{x}, \phi) \in X$ is budget feasible at consumption prices $p = (1, q)$ if for each $\omega \in \Omega$ we have

$$p \cdot \tilde{x}(\omega) \leq p \cdot e + p \cdot y(\omega)\mathbf{1}_{\phi \neq 0},$$

  - where $\mathbf{1}_{\phi \neq 0}$ is the indicator function of condition $\phi \neq 0$.
- At given prices p, the set of budget-feasible vectors is denoted by $B(p)$

- There is a utility function $u : \mathbb{R}^2_+ \times \mathbb{F} \to \mathbb{R}$
- Let β denote a probability measure on $A := \{H, L\} \times \{H, L\}$ that represents agents' beliefs
- Agents maximize the expected utility of their plan

$$(\tilde{x}, \phi) \in B(p)$$

- Expected utility is given by

$$\mathbb{E}[u(\tilde{x}, \phi|\beta)] = \sum_{\mathbf{a} \in A} u(\tilde{x}(\omega), \phi)\pi(\omega|\phi, \mathbf{a})\beta(\mathbf{a}),$$

$$\text{where} \quad \pi(\omega|\phi, \mathbf{a}) = \begin{cases} \pi(\omega|(\phi_a, \mathbf{a}_{-\phi_r})) & \text{if} \quad \phi \neq 0 \\ \pi(\omega|\mathbf{a}) & \text{if} \quad \phi = 0 \end{cases}.$$

A probability measure μ on $\mathbb{R}^{2|\Omega|} \times \mathbb{F}$ is consistent if

$$0 < \mu(\{(\tilde{x}, \phi) : \phi_r = r_1\}) = \mu(\{(\tilde{x}, \phi) : \phi_r = r_2\}) < 1.$$

Note that a consistent probability satisfies $\mu(\{(\tilde{x}, \phi) : \phi \neq 0\}) \neq 0$.

Let μ be a consistent probability measure on $\mathbb{R}^{2|\Omega|} \times \mathbb{F}$, define the probability that action (a_1, a_2) is taken in the interaction conditional on the consistent probability by

$$\gamma((a_1, a_2)|\mu) = \frac{\mu(\{(\tilde{x}, \phi) : \phi = (r_1, a_1)\}) + \mu(\{(\tilde{x}, \phi) : \phi = (r_2, a_2)}{\mu(\{(\tilde{x}, \phi) : \phi \neq 0\})}.$$

A consistent probability measure μ on $\mathbb{R}^{2|\Omega|} \times \mathbb{F}$ is a feasible configuration for the economy given:

- Feasibility: $\mu(\{(\tilde{x}, \phi) : (\tilde{x}, \phi) \notin X\}) = 0$ and
- Market Clearing: $X(\mu) = Y(\mu) + (1, 0)$.

A common beliefs equilibrium of the economy is given by a tuple $(\overline{q}, \beta, \mu) \in \mathbb{R}^2_+ \times \mathcal{P}(A) \times \mathcal{P}(\mathbb{R}^{2|\Omega|} \times \mathbb{F})$ such that:

1. μ is a feasible configuration
2. Individual budget feasibility: $\mu(\{(\tilde{x}, \phi) : (\tilde{x}, \phi) \notin B(p)\}) = 0$
3. Optimality: $\mu(\{(\tilde{x}, \phi) : \exists(\tilde{x}', \phi') \in X \cap B(p), \mathbb{E}[u(\tilde{x}', \phi')|\beta] > \mathbb{E}[u(\tilde{x}, \phi)|\beta]\}) = 0$
4. Correct beliefs: $\beta = \gamma(\cdot|\mu)$.

Parameterization

Consider a family of economies parameterized by the medium output $C_m \in [1,2]$, assuming $C_g = 2,\ C_b = 1$.

Utility function $u : \mathbb{R}^2_+ \times \mathbb{F} \to \mathbb{R}$ exhibits high-action cost if $u(\cdot, H) \leq u(\cdot, L)$.

$$u(x_1, x_2, \phi, C_m) = \begin{cases} \sqrt{x_1 x_2} & \text{if} \quad \text{otherwise} \\ T\left(\sqrt{x_1 x_2}\right) & \text{if} \quad \phi_a = H, \end{cases}$$

$$\text{where } T(t, C_m) = \begin{cases} \frac{C_m}{2} \cdot t & \text{if} \quad t \in \left[0, \frac{1}{\sqrt{C_m}}\right] \\ \frac{\sqrt{C_m}}{2} + \frac{1}{15}\left(t - \frac{1}{\sqrt{C_m}}\right) & \text{if} \quad t \in \left[\frac{1}{\sqrt{C_m}}, +\infty\right[. \end{cases}$$

Table 3: Welfare dependence on action and medium output for row player

	H		L
H	$\frac{\sqrt{C_m}}{2}$		$\frac{C_m^{\frac{3}{2}}}{4}$
L	$\frac{\sqrt{C_m}}{2}$		$\frac{1}{2\sqrt{C_m}}$
0		$\frac{\sqrt{C_m}}{2}$	

	H		L
H	$\frac{\sqrt{C_m}}{2} + \frac{1}{15\sqrt{C_m}}(\sqrt{C_m} - 1)$		$\frac{C_m^2}{4}^{\star}$
L	$\frac{C_m}{2}$		$\frac{1}{2}$
0		$\frac{1}{2}$	

*: Welfare level $C_m^2/4$ represents $H(C_m/2)$ when $C_m \leq 1.59$, otherwise $H(C_m/2) = \sqrt{C_m}/2 + (1/15)(C_m/2 - 1/\sqrt{C_m})\}$

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