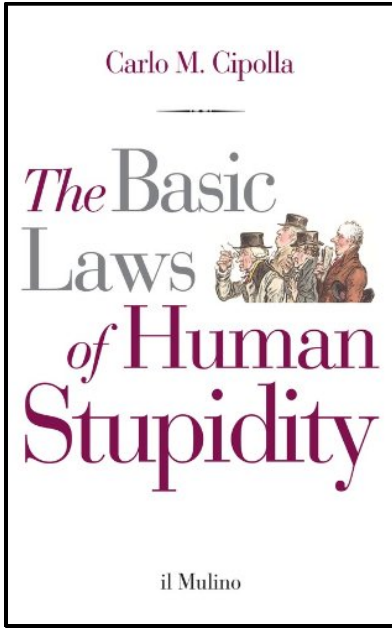
Testing Carlo Cipolla's Laws of Human Stupidity with Agent-Based Modeling

Andrea G. B. Tettamanzi and Célia da Costa Pereira

Université Nice Sophia Antipolis, I3S, UMR 7271
06900 Sophia Antipolis, France

Research Question



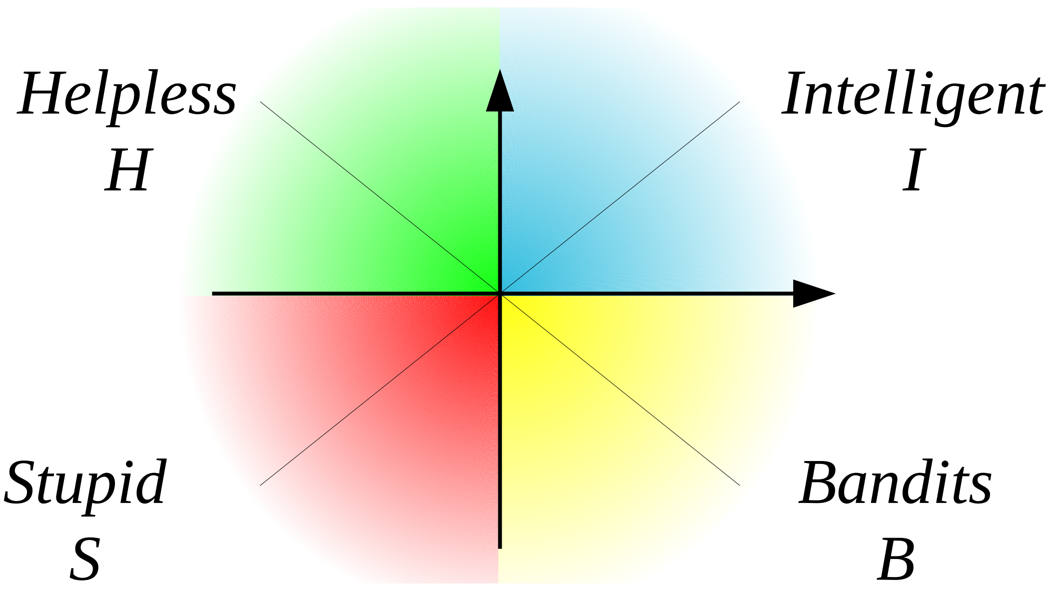
- C. Cipolla (1976). *The Basic Laws of Human Stupidity.*
- Tongue-in-cheek, but in most cultures humor is a way to tell truths that hurt without breaking social norms.
- If taken seriously, Cipolla's theory should enable us to make falsifiable claims.
- We consider Darwin's theory of evolution well corroborated.
- **Is Cipolla's theory of human stupidity compatible with Darwin's theory of evolution?**
- **Under which assumptions do the two theories not contradict each other?**
- We use agent-based simulation to answer these questions.

Cipolla's Theory of Human Stupidity

- Stupidity is the main obstacle to welfare in human societies
- Why is stupidity so powerful and hard to act against?

- Abstract model of a human agent's social behavior:
  - X: average gain (loss) agent obtains for its actions
  - Y: average gain (loss) agent causes to other agents with its actions

Social Behavior



Cipolla's Five "Laws" of Human Stupidity

1. Any numerical estimate of the fraction σ of stupid people always and inevitably turns out to be an underestimate
2. The probability that a given person be stupid is independent of any other characteristic of that person
3. A stupid person is a person who causes losses to other persons while himself deriving no gain and even possibly incurring a loss
4. Non-stupid people always underestimate the damaging power of stupid individuals
5. A stupid person is the most dangerous type of person

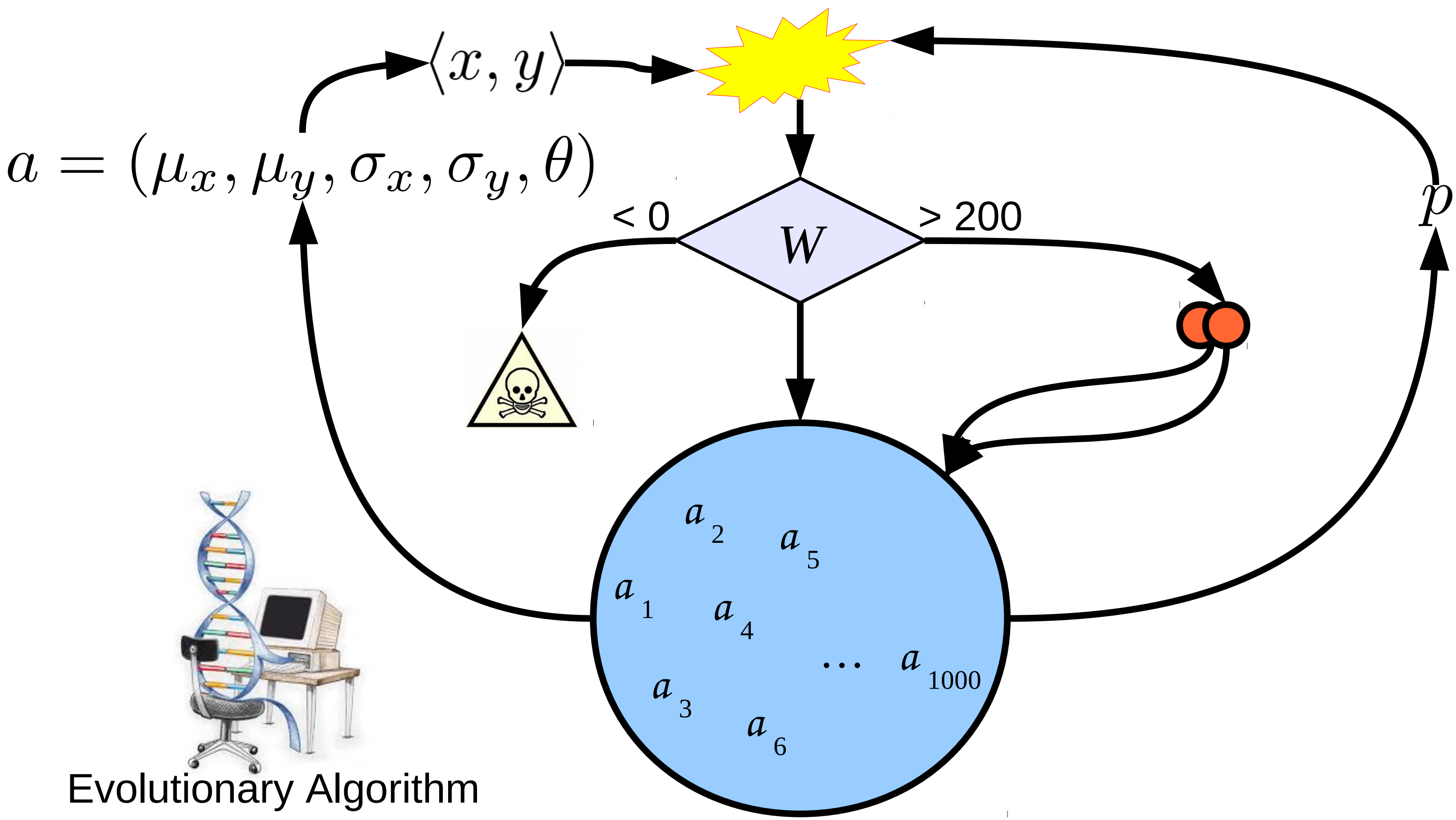
Critique

- A consequence of Cipolla's 1st and 2nd laws is that stupid people must be an overwhelming majority of any sample population
- Apparent contradiction with Darwinian natural selection:
  - Stupid and helpless people should have a competitive disadvantage vis-à-vis more opportunistic individuals
  - In the log run, one would expect rational individuals (= intelligent + bandits) to take over the entire population
- Possible explanatory hypotheses (to test):
  - Damages stupid people cause to others neutralize selection
  - Stupid people are more resilient to damages inflicted by others
  - The observed fraction is the effect of particular initial conditions
  - Etc...

An Agent-Based Model

- Agent behavior governed by a bivariate normal PD
- Agents are individuals of an evolutionary algorithm
- Agents' genome: $(\mu_x, \mu_y, \sigma_x, \sigma_y, \theta)$
- Agents in the initial population have a wealth of 100
- Death when wealth < 0; asexual division when wealth > 200
- Agent interaction cycle (= 1 simulation period):
  - "active" agent randomly selected from the population
  - "passive" agent randomly selected from the remaining agents
  - <*x*, *y*> randomly extracted form the active agent's PD
  - Active agent's wealth updated according to *x*
  - Passive agent's wealth updated according to *y*

An Agent-Based Model



Wealth Distribution

- In general, not a zero-sum game:
  - If most agents act intelligently, the population will enjoy an overall wealth increase
  - If most agents act stupidly, the overall welfare of the population will decrease and nothing prevents it from becoming extinct
- One may enforce a zero-sum game by redistributing net wealth surplus or loss proportionally to all the agents in the population

Wealth Transfer

Linear

$$W^a_{t+1} = W^a_t + x \qquad W^p_{t+1} = W^p_t + y$$

Logarithmic

$$W^a_{t+1} = \begin{cases} W^a_t + x, & \text{if } x \leq 0; \\ W^a_t + \log(x+1), & \text{otherwise}; \end{cases}$$

Hyperbolic

$$W^a_{t+1} = \begin{cases} W^a_t + x, & \text{if } x \leq 0; \\ W^a_t + \frac{x}{x+1}, & \text{otherwise}; \end{cases}$$

Defense

- To model the fact that rational agents know better
- Rational agents are able to build defenses against bandits (but not against stupid agents, by Cipolla's 4th and 5th laws)
- In an interaction, if the active agent is behaving like a bandit (i.e., $x > 0$ and $y < 0$), both x and y are discounted by multiplying them by a “defense factor” 1 - δ.

$$\delta = \frac{\mu_x^p}{\mu_x^p + 1}$$

Relativized Effects of an Interaction

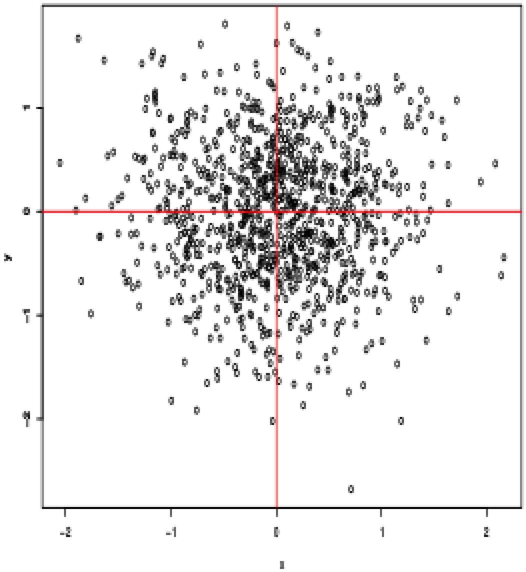
- To model the hypothesis that stupid agents are more resilient than others to damages inflicted by their peers
- The *x* and *y* effects of an interaction are “relativized” with respect to the μ_x of the receiving agent (be it active or passive)
- The active agent's wealth will be updated according to

$$x - \mu_x^a$$

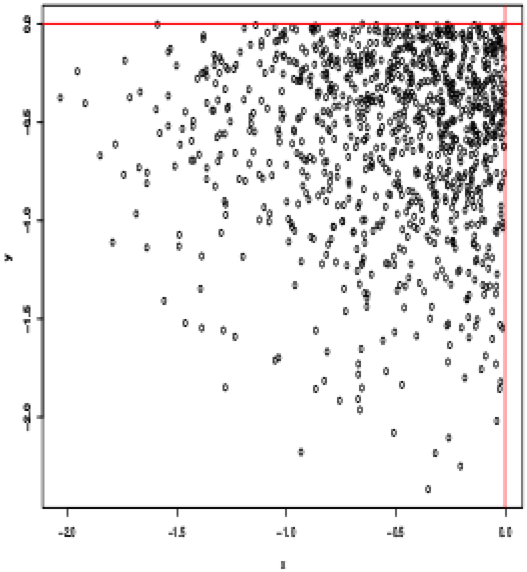
- The passive agent's wealth will be updated according to

$$y - \mu_x^p$$

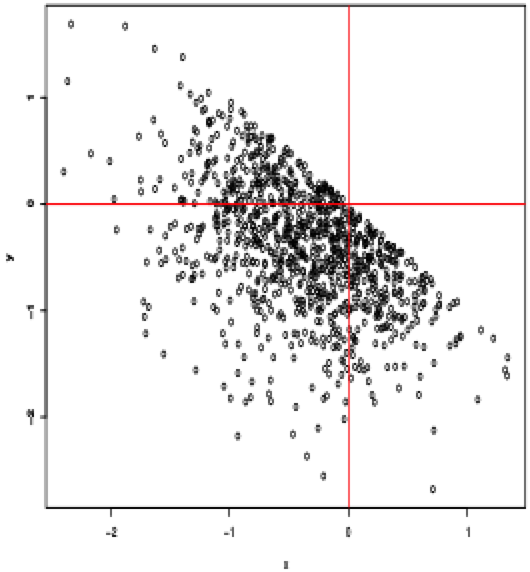
Initial Distribution



all



stupid



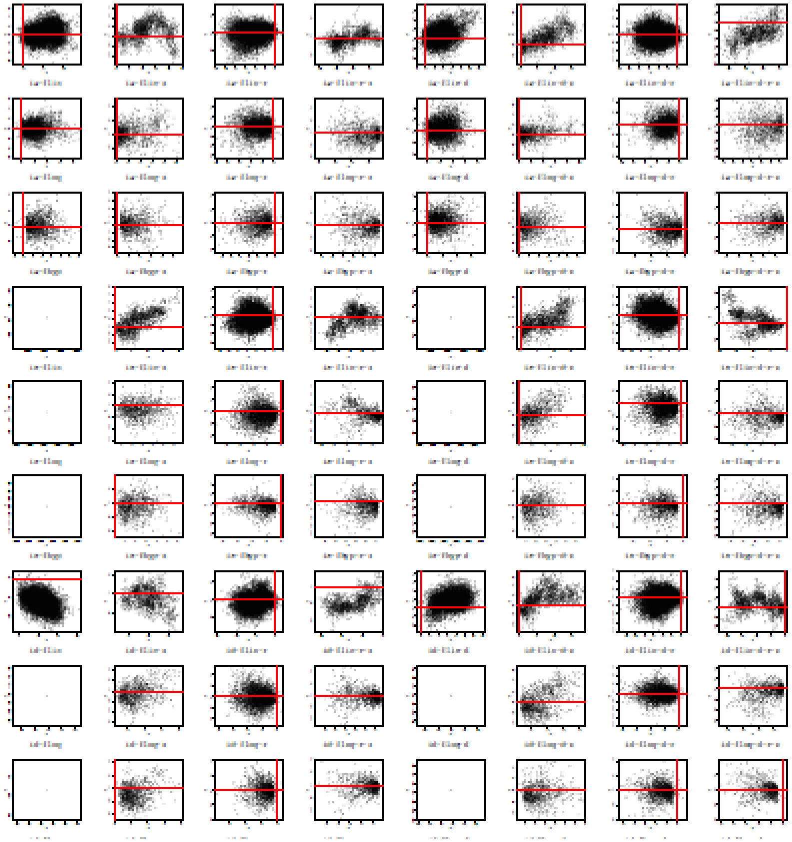
deleterious

Experimental Protocol

- We tried all combinations of the following parameters
  - Initial distribution: `i` = all | stupid | deleterious
  - Transfer function: `f` = linear | logarithmic | hyperbolic
  - Defense: d = off | on
  - Relativized effects: `r` = off | on
  - Zero-sum game: `z` = off | on
- This gives a total of 72 combinations
- We code-name combinations as strings of parameters:

  \- Example: `ia-flin-d-r-z`
- Initial population: 1,000 agents. Max population: 10,000 agents
- Simulation length: 1,000,000 periods

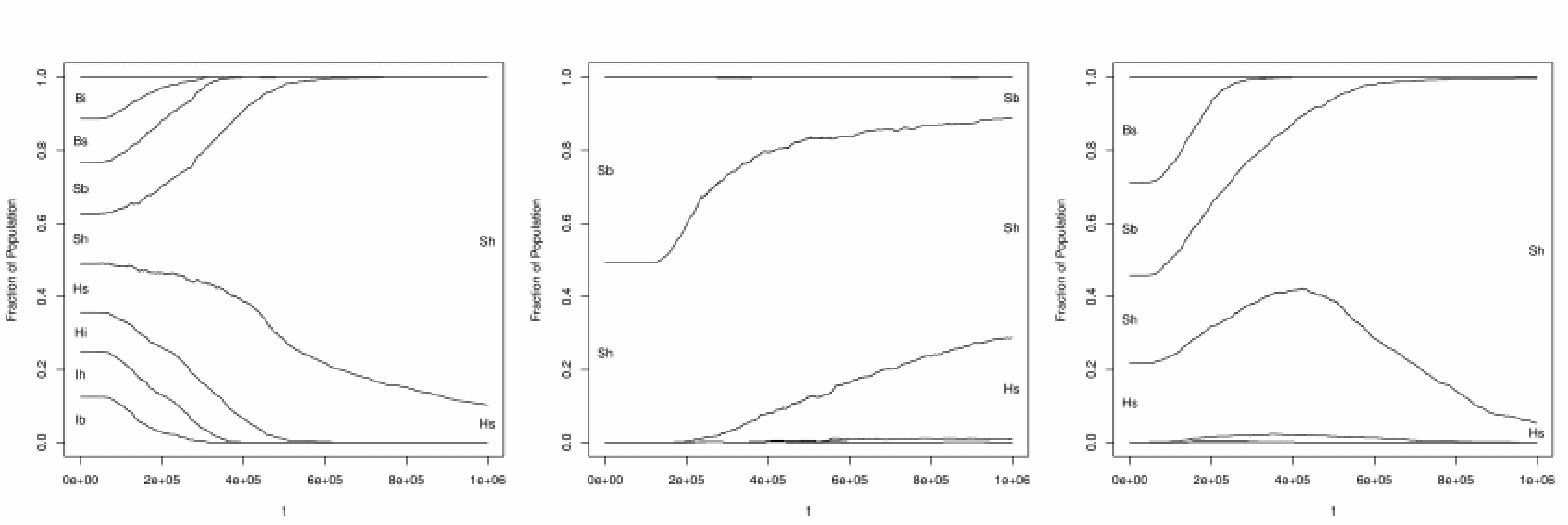
Results: Final Distributions



Results: Observations

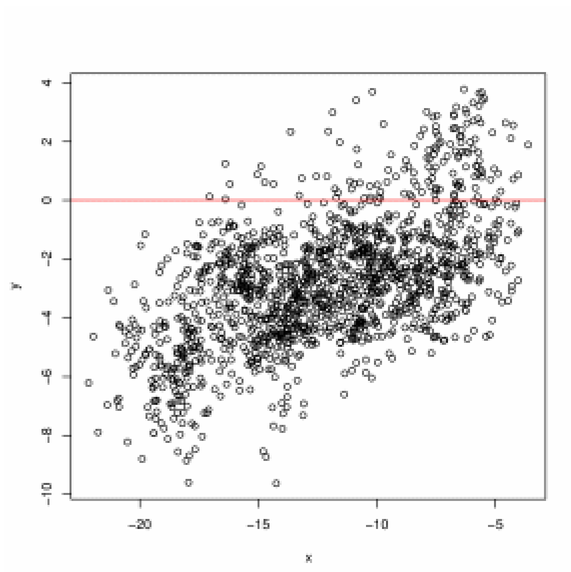
- A first inspection of the final distributions reveals the following:
  - Relativization of the effects is critical to the survival and proliferation of stupid agents
  - Restricting our attention to runs with `r` = on, the most promising distributions may be observed when a zero-sum game is enforced
  - The only setting which results in a preponderance of stupid agents from a “neutral” initial distribution is `ia-flin-d-r-z`, with defense turned on
  - An initial distribution biased toward stupid agents appears to favor the prevalence of stupid agents in the final distribution
- Overall, eight parameter settings achieved a final distribution featuring a majority of stupid agents.

Evolution of Population Composition

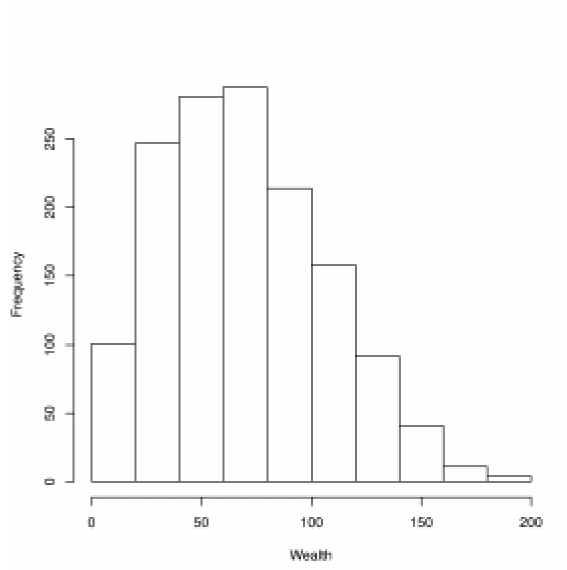


`ia-flin-d-r-z` `is-fhyp-r` `id-flin-r-z`

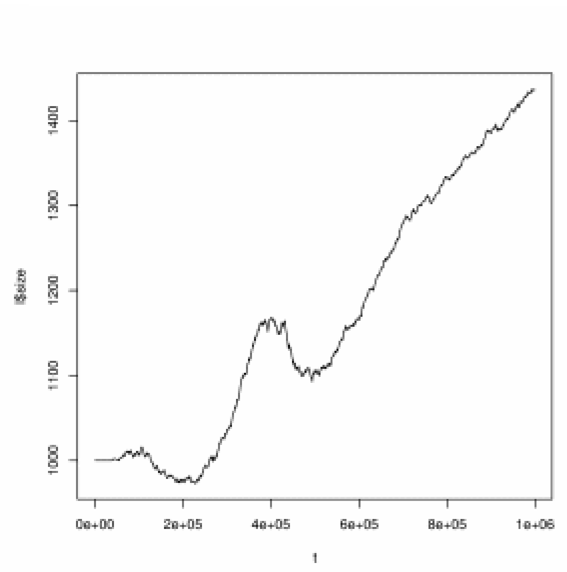
Simulation `ia-flin-d-r-z`



Final distribution



Final wealth distribution



Population size

Conclusion

- Some of the parameter settings we have tried led to emergent behaviors quite in line with Carlo Cipolla's theory
- One parameter setting, in particular, namely `ia-flin-d-r-z`, looks like a very promising first approximation of Cipolla's laws
- Zero-sum game enforcement appears to be critical.
  - This is not obvious and calls for an explanation
  - The subjective utility of the agents is somehow relative to the welfare of their peers (envy?)