



# Computer Simulation Experiments of Participatory Annual Planning

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# Participatory Planning: Context

- Non-market, non-command-planning allocation mechanism in PE
- Procedure in brief: Councils propose plans, revising in a series of iterations, until excess demand is eliminated.
- Key question: How practical is participatory planning? That is, how many iterations does it take for a participatory planning procedure to arrive at a feasible plan? That is our focus in this presentation.



# Participatory Planning: Details

- *Dramatis personae:*
  - Worker councils, consumer councils
  - Federations of worker councils / consumer councils
  - Iteration facilitation board
- Procedure:
  - IFB announces “indicative prices” (our best indication of opportunity/social costs)
  - Consumption councils make consumption proposals, workers councils make production proposals
  - IFB adjusts prices based on demands and supplies.
  - Repeat until there's no excess demand.



# pequod-cljs

- Derived from an original Netlogo tool, Pequod (Participatory Planning Procedure Prototype).
- Adapted to Clojure, Clojurescript for scalability, flexibility.
- Originally written in Clojurescript, adapted to Clojure.



# The algorithm

- Define variables, including arbitrary price vector.
- Generate/load worker councils and consumer councils.
- Apply production/consumption functions (Cobb Douglas).
- Adjust prices and surpluses across all categories (experimentation to find an efficient price adjustment rule led to  $w = v(1.05 - 0.5^v)$  except when  $v > 0.25$ ; there's room for improvement here).
- Increase iteration counter by one.
- Check if surpluses lie within specified threshold. If so, stop. If not, return to step 3 (apply prod/consumption fn's) and repeat.
- Repeat experiment starting with previous experiment's prices.



# Experiments

- 40 randomly generated experiments, each with
  - 30,000 worker councils
  - 30,000 consumer councils
  - 100 private consumption goods
  - 100 public goods
  - 100 intermediate goods
  - 100 categories of labor
  - 100 natural environment inputs



# Summarized Results

- To 5% threshold from arbitrary price vector: avg. 11.85 iterations.
- To 3% threshold from arbitrary price vector: avg. 19.2 iterations.
- To 5% threshold from previous experiment's price vector, accounting for technology changes and consumer preferences' changes: avg. 6.5 iterations, avg. GDP percentage increase 2.446%.
- Increasing returns to scale: avg. 6.25 iterations, avg. GDP percentage increase 1.859%.
- Full details in Hahnel, *Democratic Economic Planning*, London: Routledge, 2021.



# Demonstration

- pequod-cljs, with iterations involving 3,000 WCs and 3,000 CCs and 10 categories of each goods (reduced so as to speed up the presentation).





# Source Code

- <https://github.com/msszczep/pequod-cljs>
- <http://www.szcz.org/depexperiments>