

Systems Thinking in Design: What if Governments Really Used It?

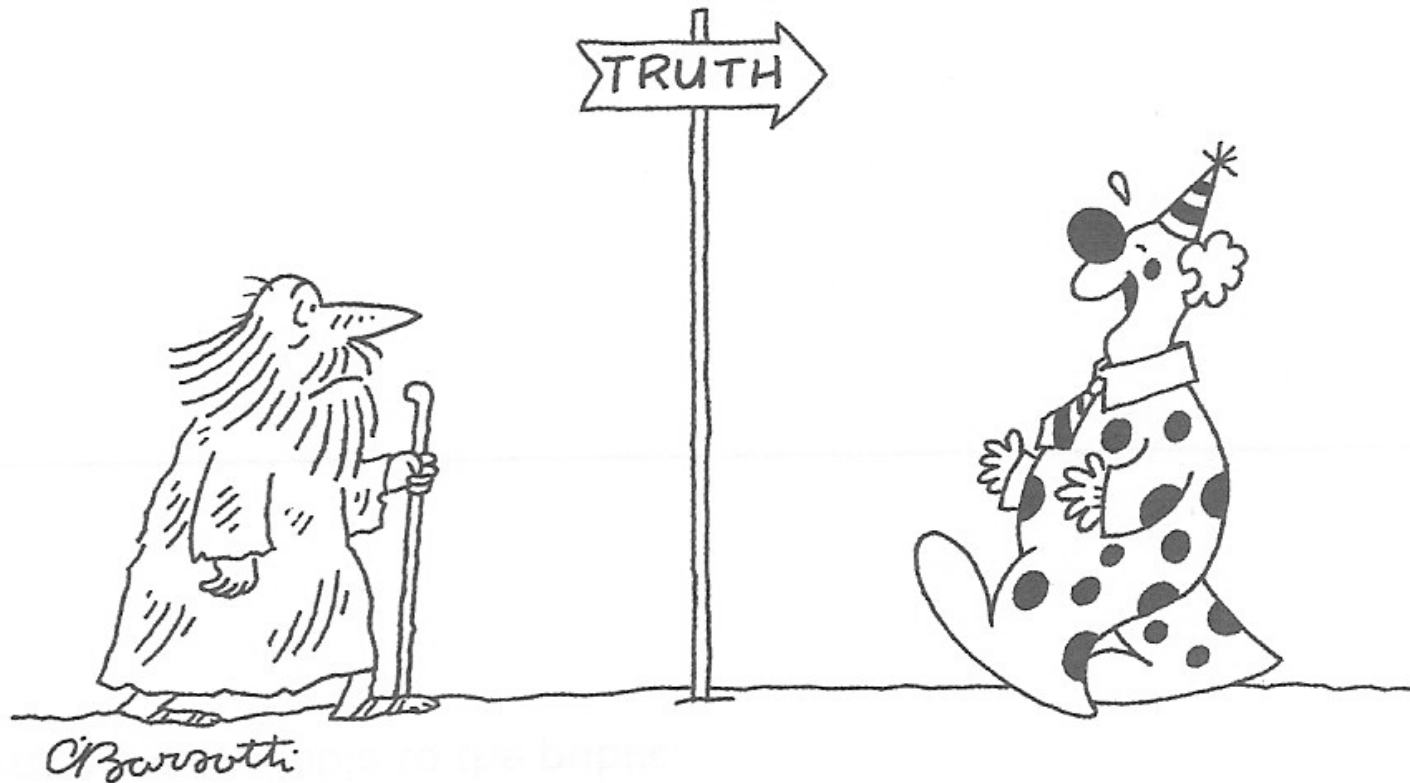
George P. Richardson

Professor Emeritus

Rockefeller College of Public Affairs and Policy

University at Albany, State University of New York





There are Lots of Systems Thinkers

Fields that say “systems”

- Systems analysis
- General systems theory
- Viable systems analysis
- Living systems theory
- Soft systems methodology
- Critical systems heuristics
- Critical systems science
- Sociotechnical systems
- System dynamics (that’s me)

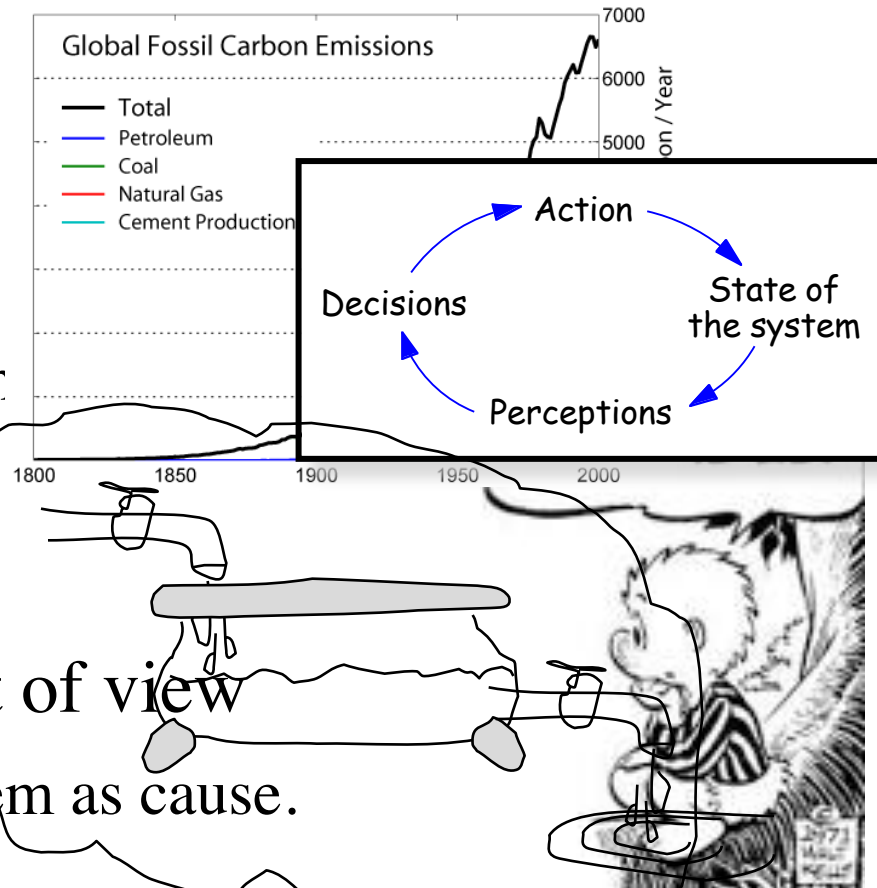
Fields that imply “systems”

- Soft operations or operational research (Soft OR)
- Strategic options development and analysis (SODA)
- Strategic assumption surfacing and testing (SAST)
- Hierarchy theory
- Interactive planning
- Cognitive mapping.
- Cybernetics (that’s Bob)

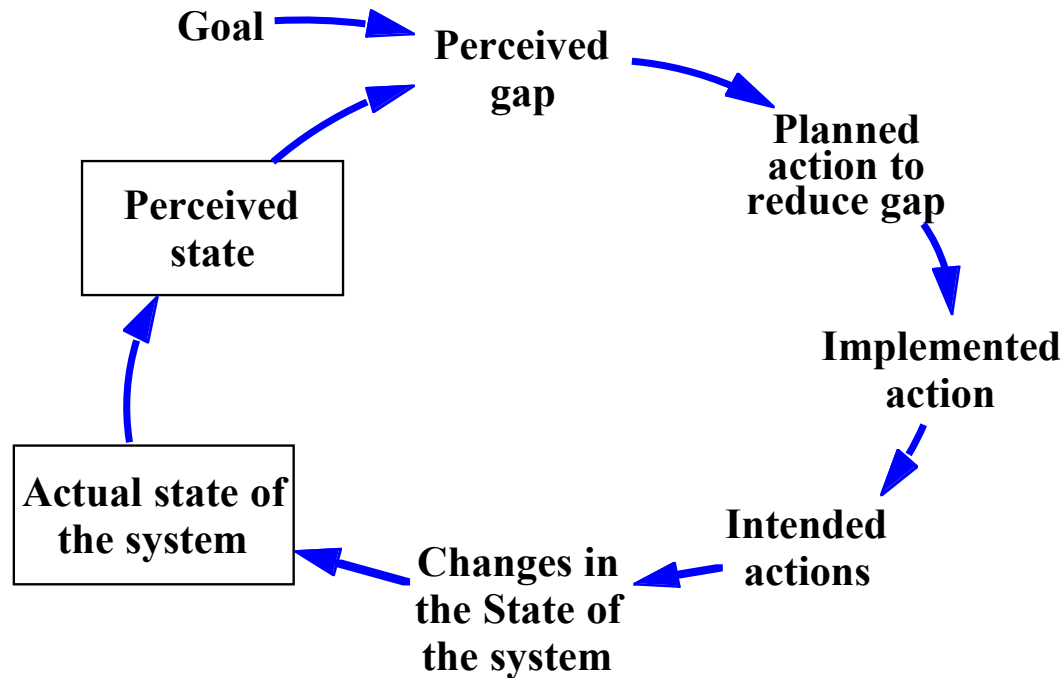


A Quick Introduction to System Dynamics

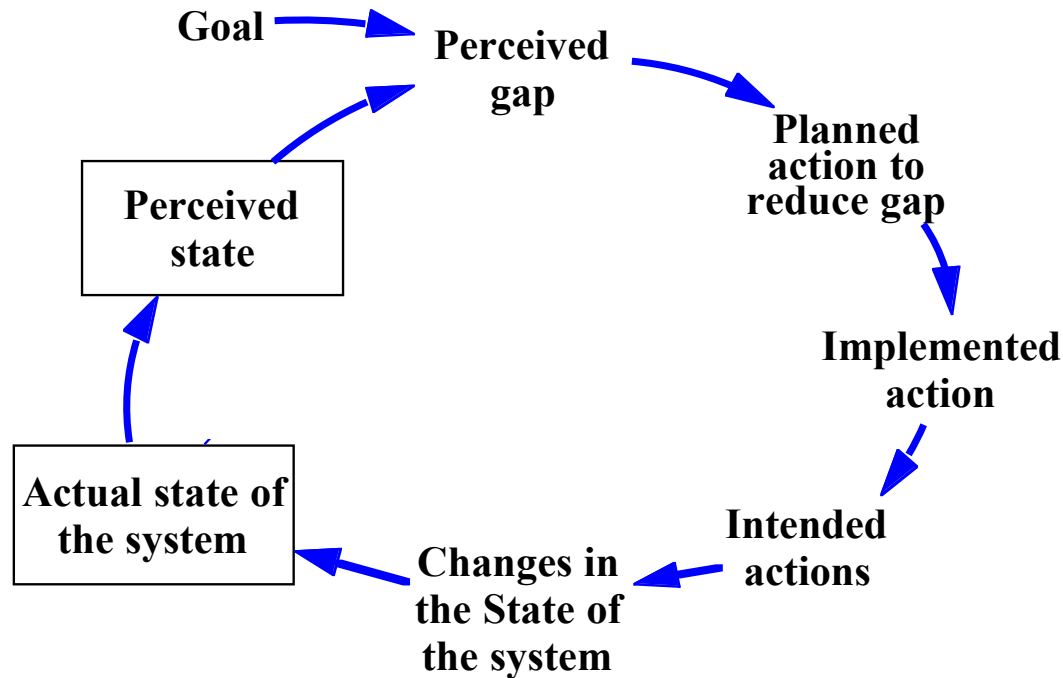
- Dynamics
 - Graphs over time
- Feedback loops
 - What goes around comes around
- Stocks
 - Accumulations
- The endogenous point of view
 - Looking inward. System as cause.



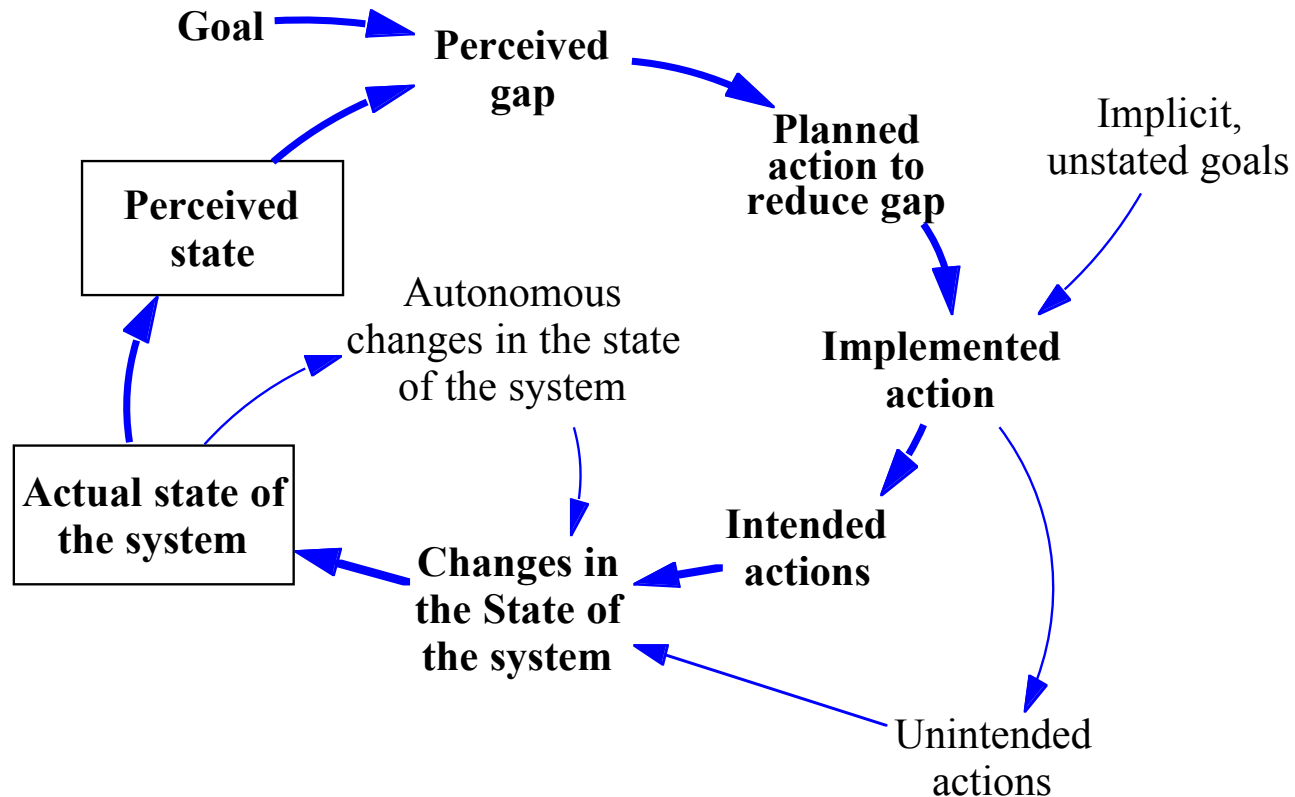
The Classic Policy Planning Loop



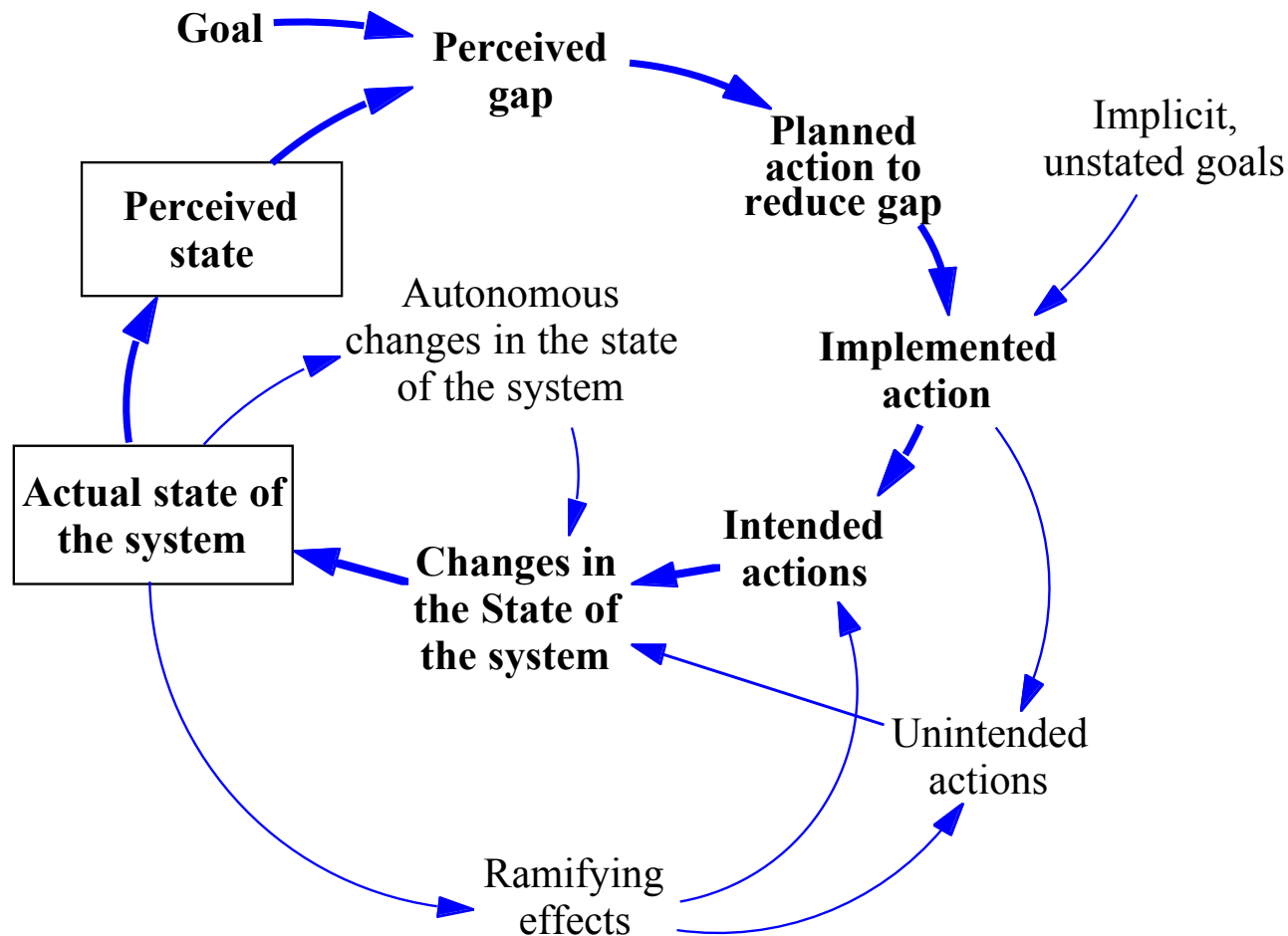
The Classic Loop with Complications



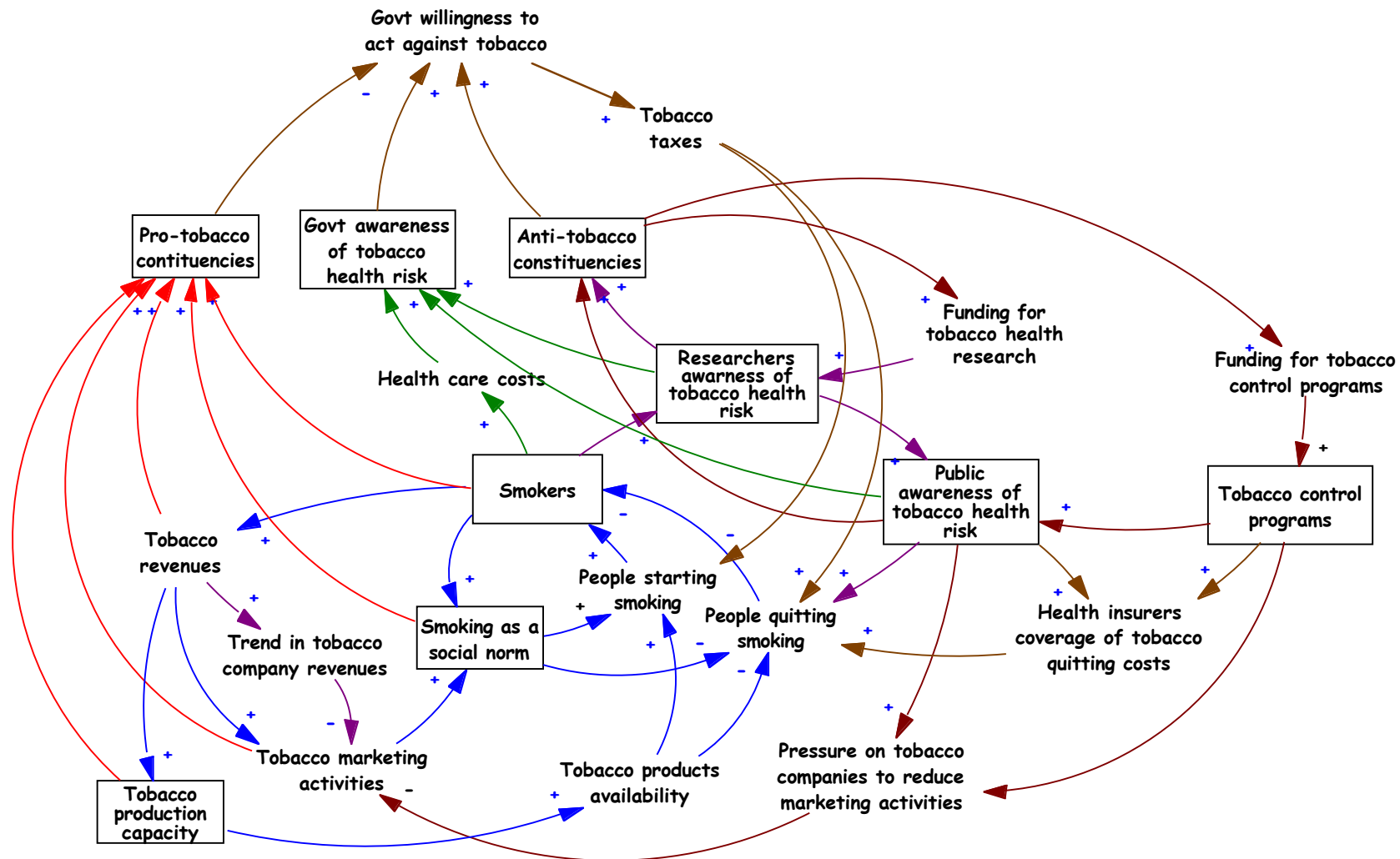
The Classic Loop with Complications



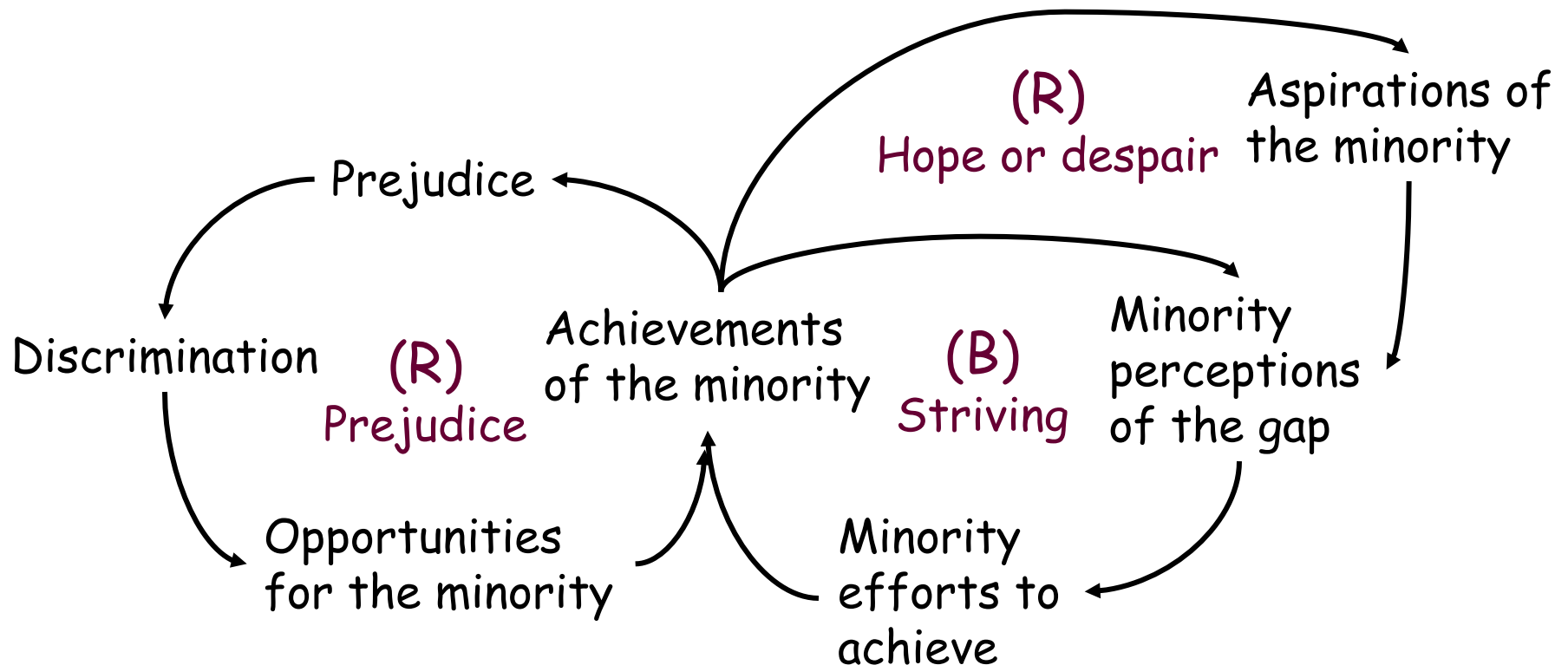
The Classic Loop with Complications



It Can Get Really Complicated!



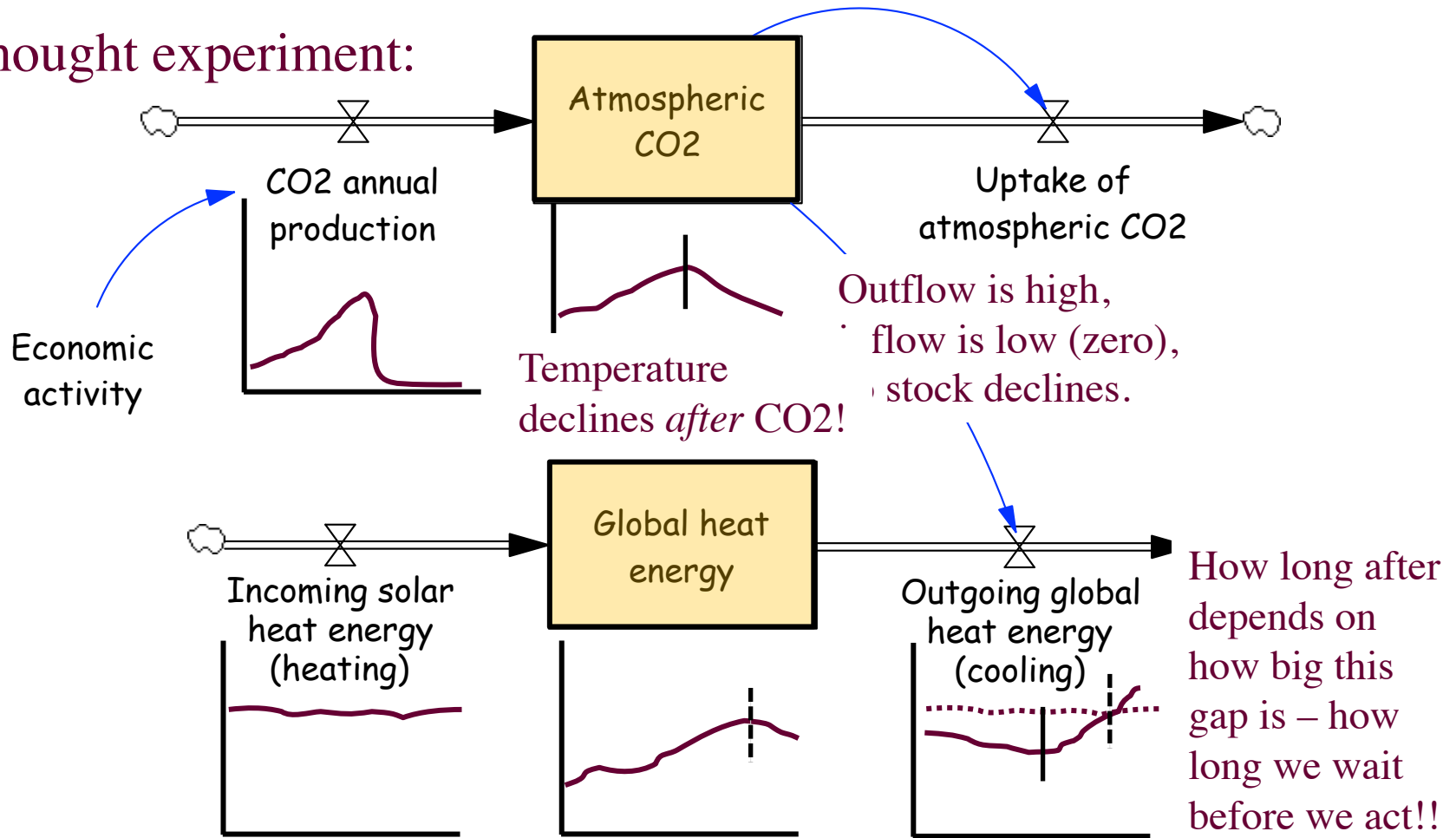
Prejudice and Minority Achievement (Myrdal, Merton)



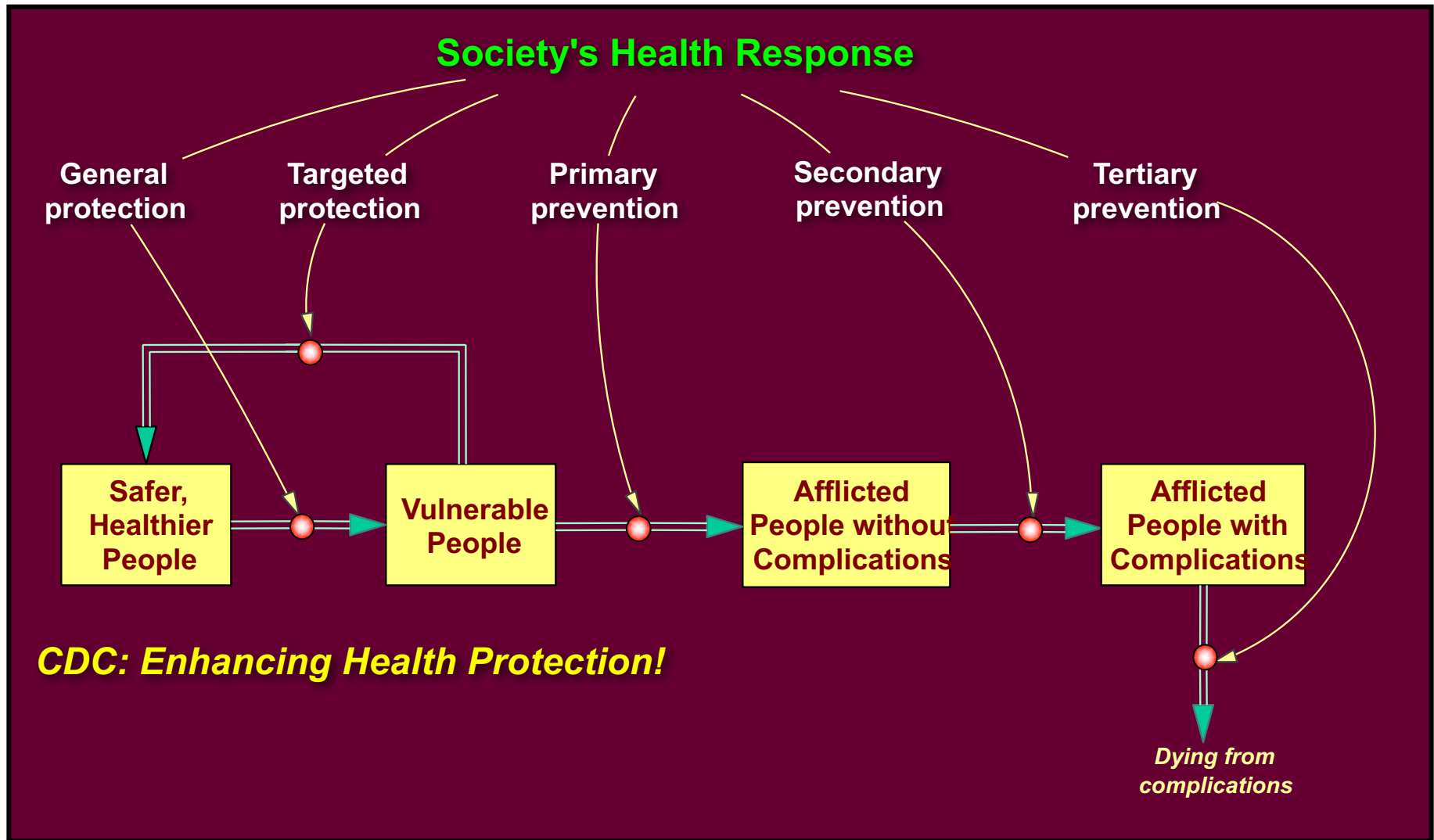
Stocks and Flows in Global Climate

(A deep insight from bathtubs, faucets, and drains)

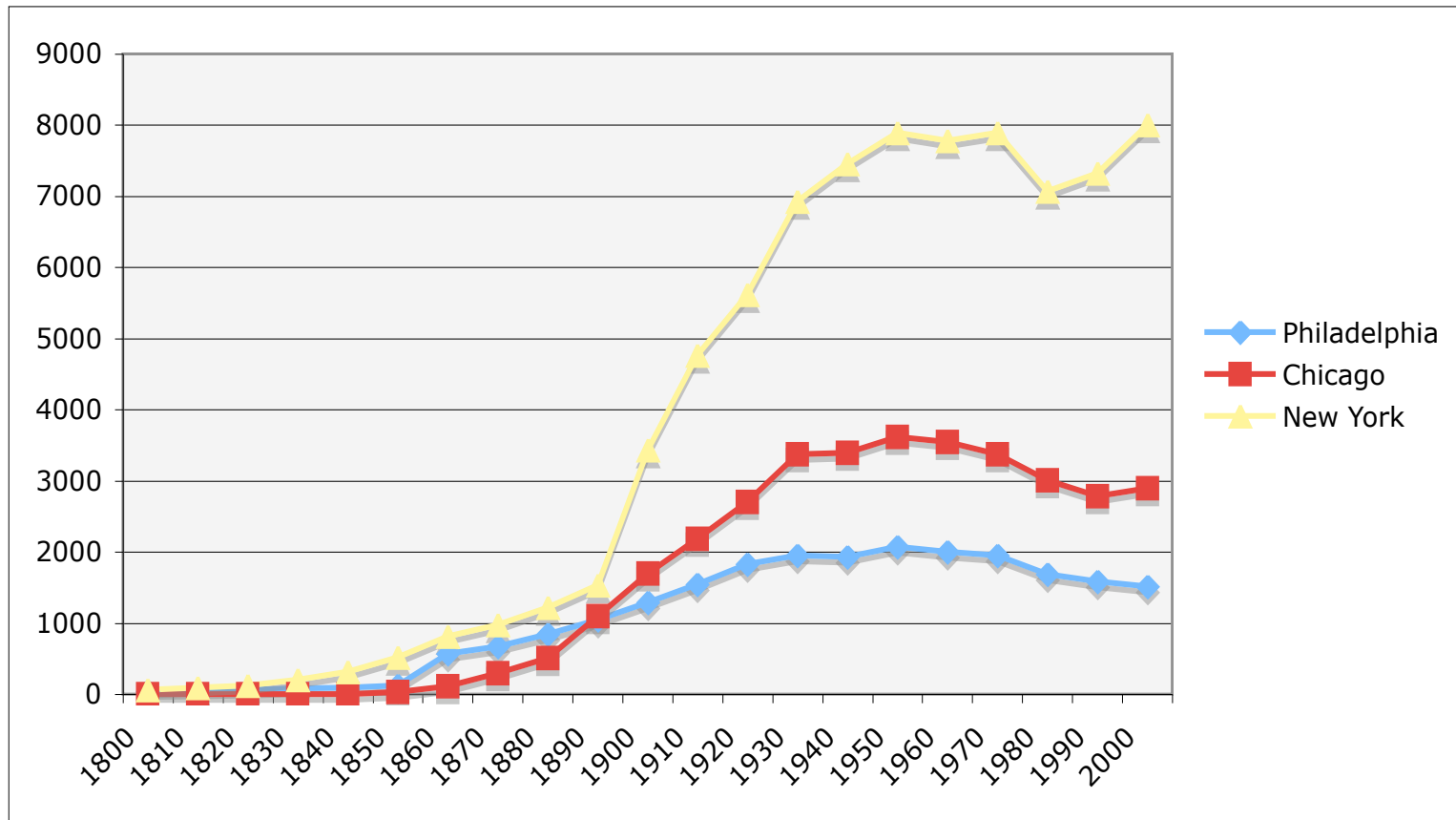
Thought experiment:



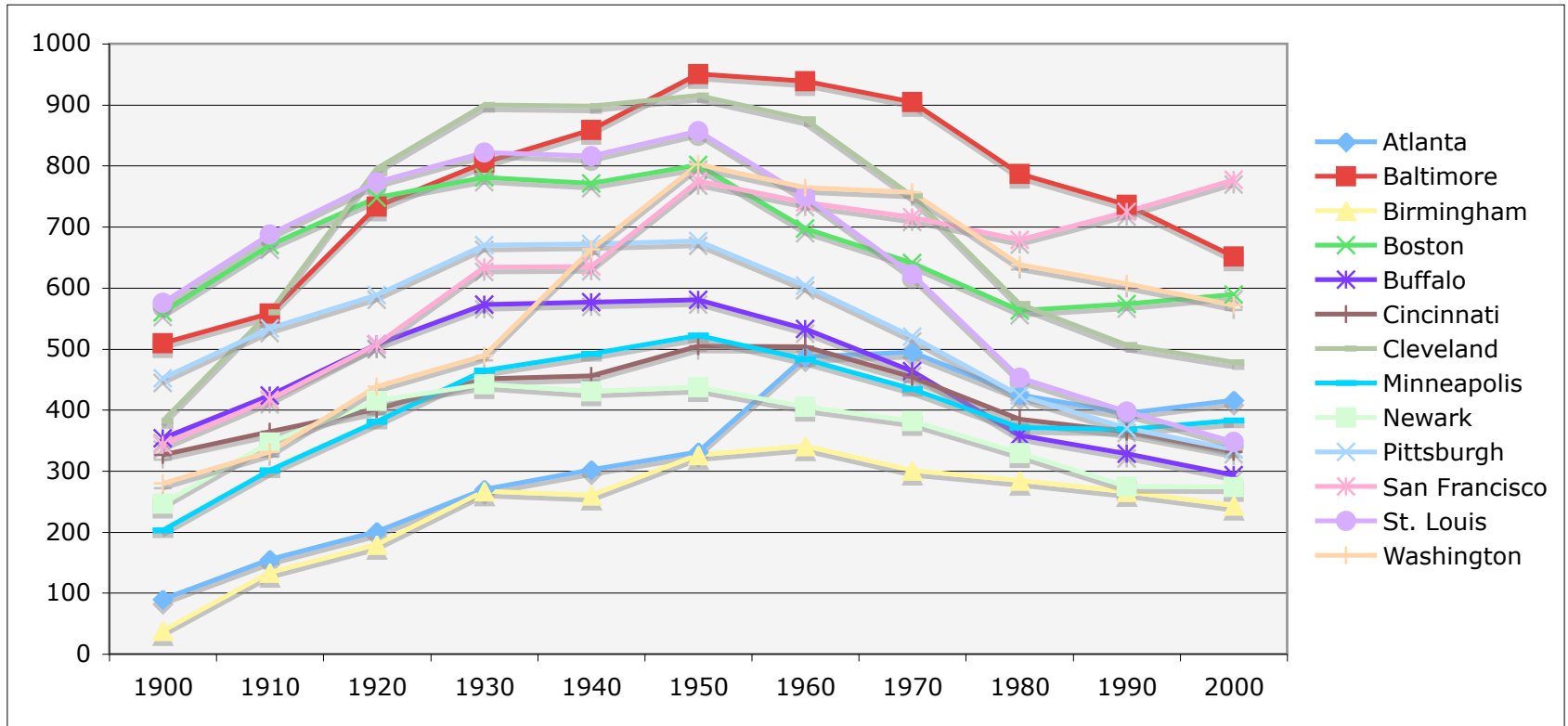
Stocks and Flows in Health Priorities



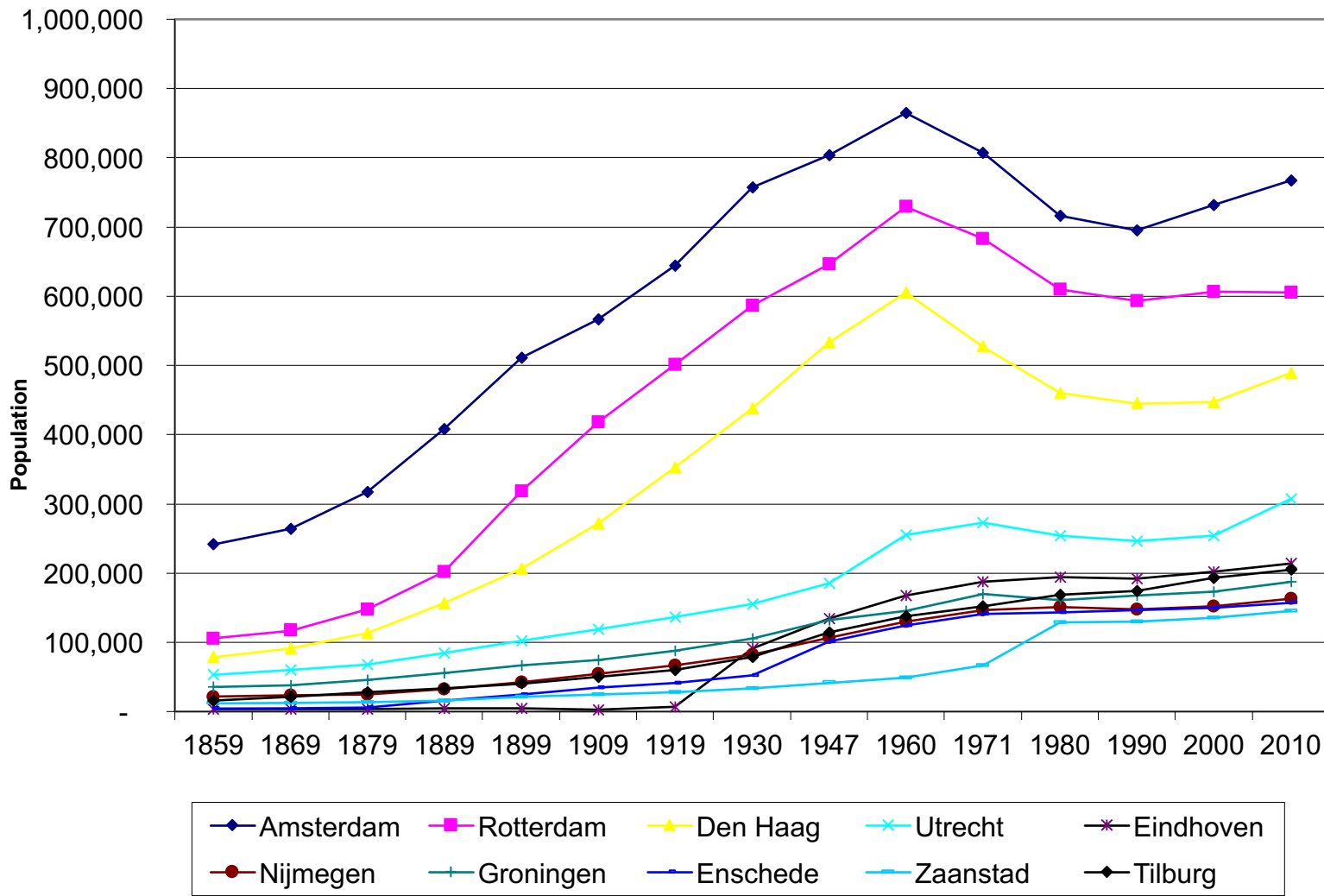
New York, Chicago & Philadelphia, 1800-2000



Populations of Selected U.S. Cities, 1900-2000



Dutch Urban Dynamics



Urban Decay Camden, NJ, USA

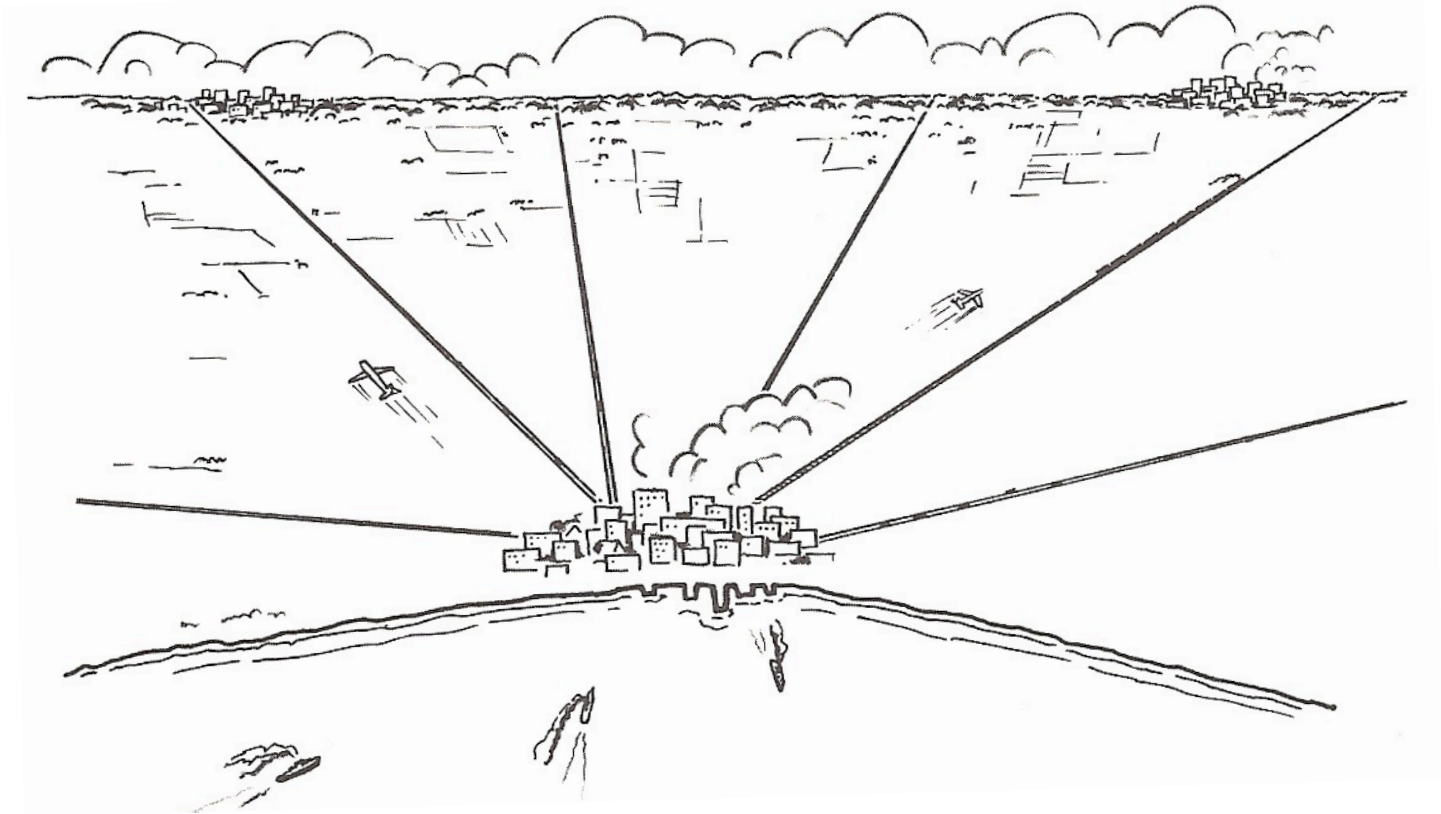


http://en.wikipedia.org/wiki/File:Camden_NJ_poverty.jpg

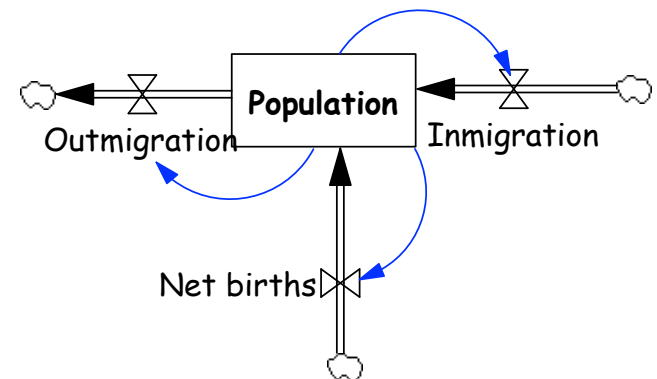
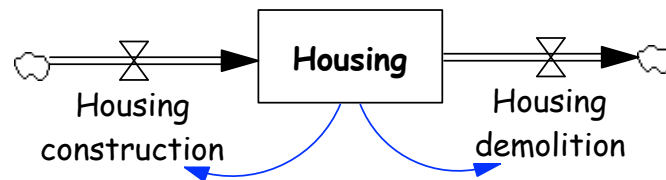
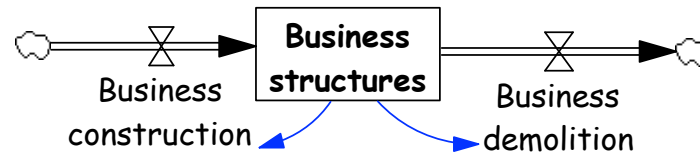
University at Albany

Chautauqua, June 2017

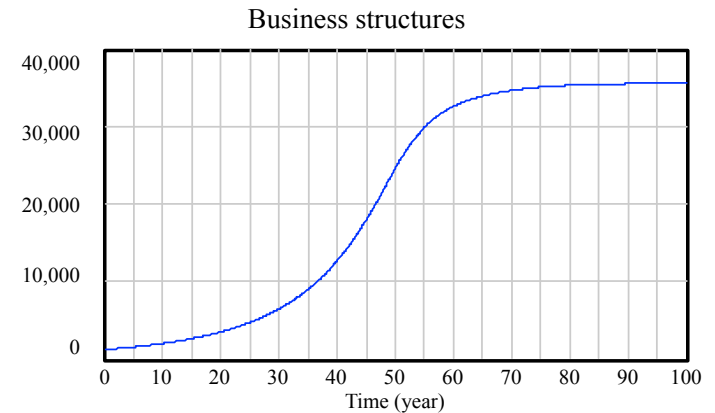
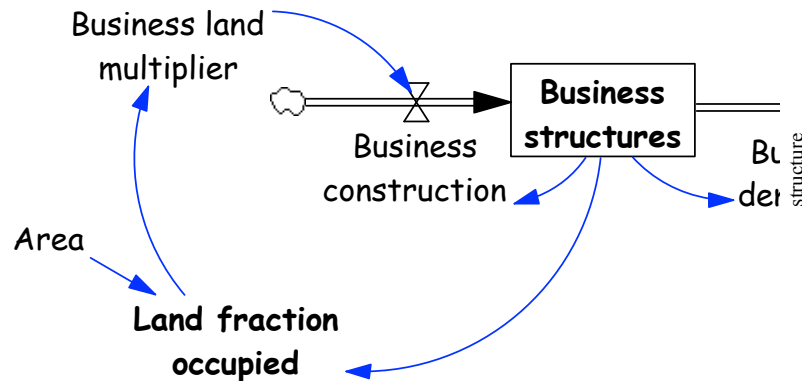
Forrester's City: Endogenous Dynamics



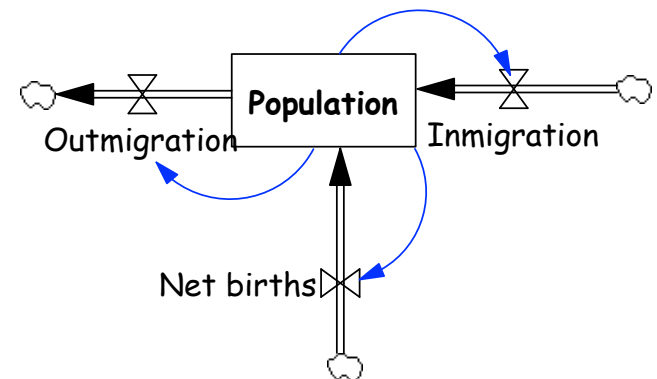
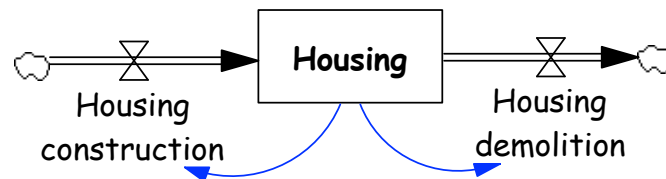
A Simple Urban Model: Urban1



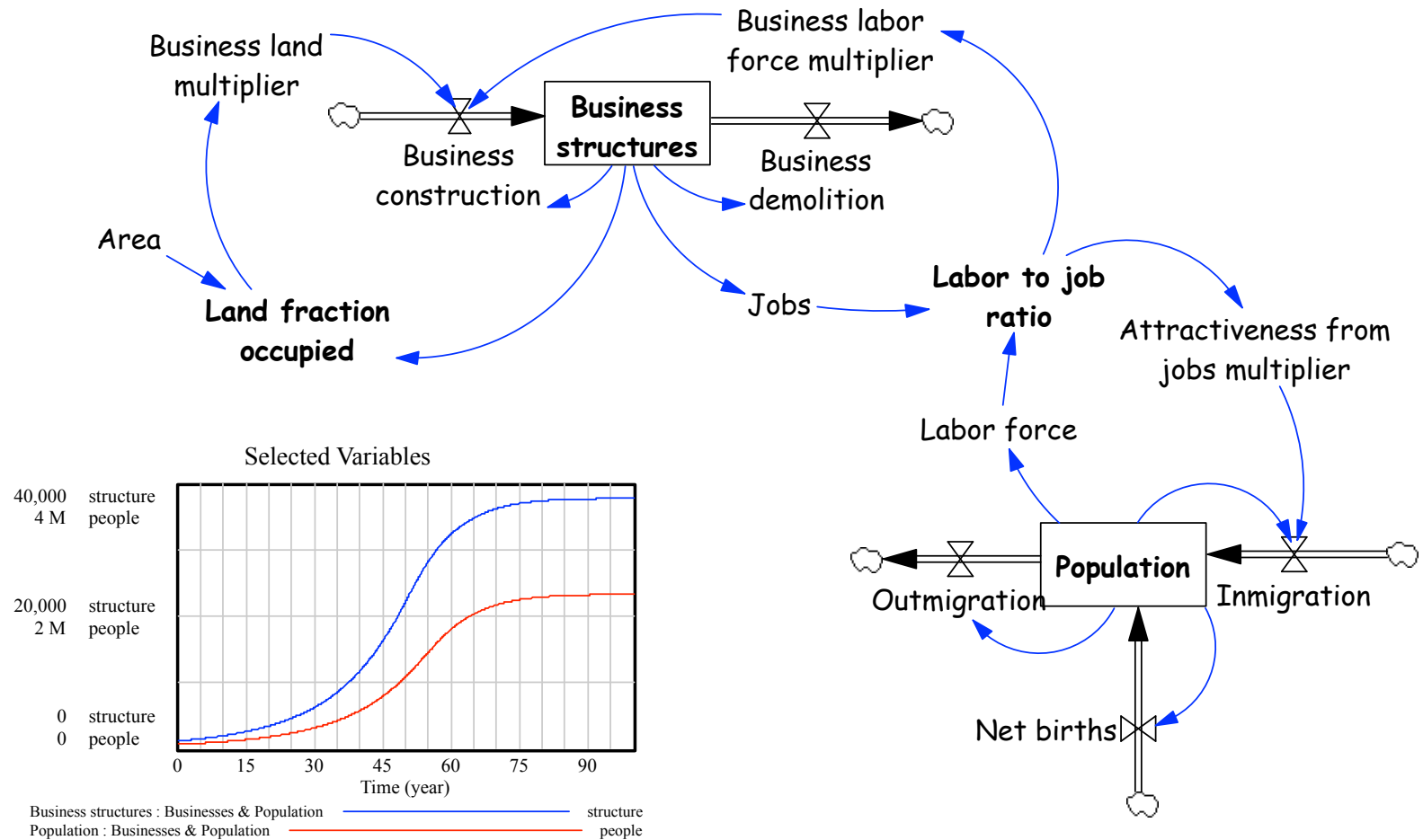
A Simple Urban Model: Urban1



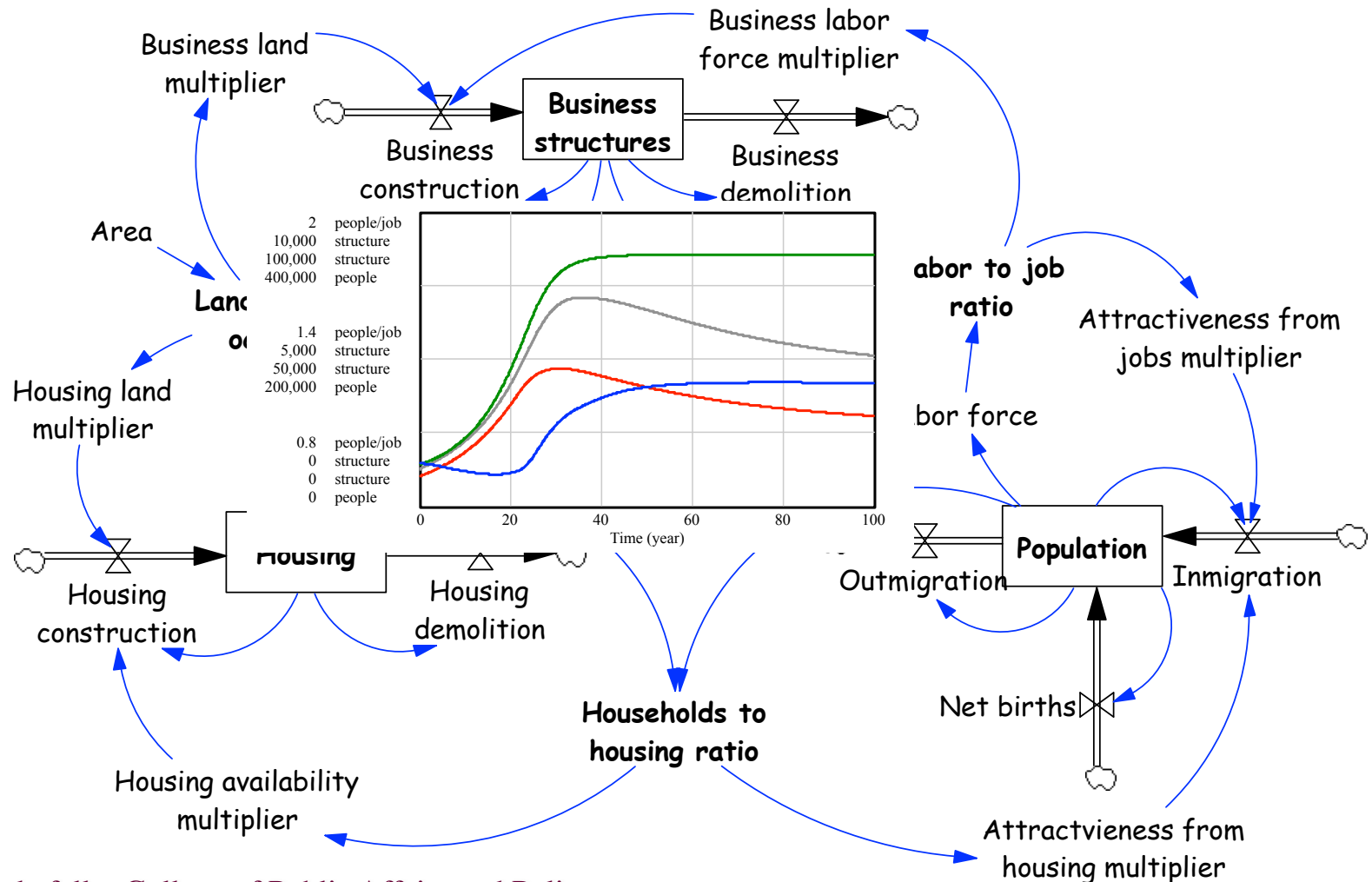
Business structures : Businesses



A Simple Urban Model: Urban1

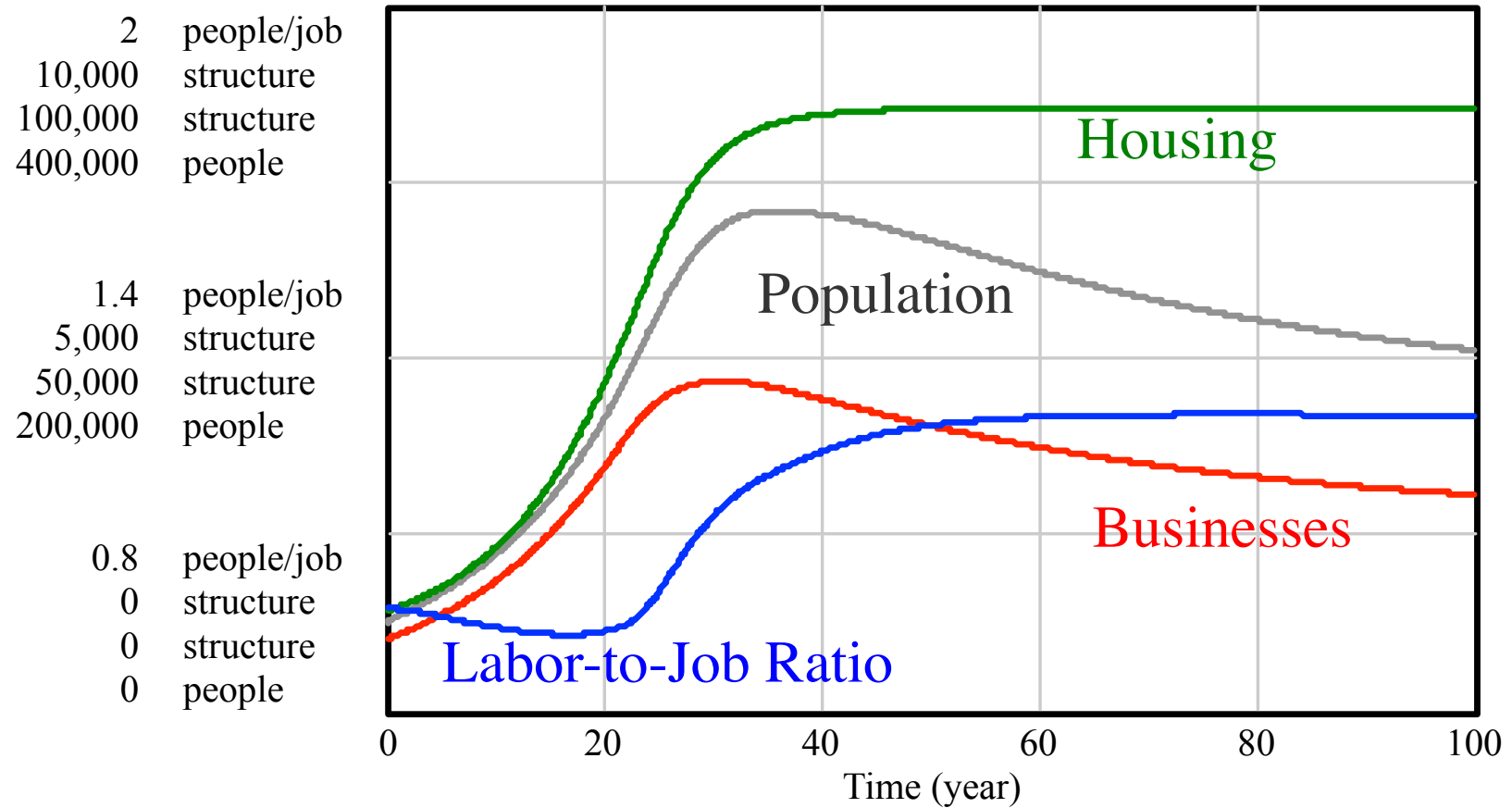


A Simple Urban Model: Urban1

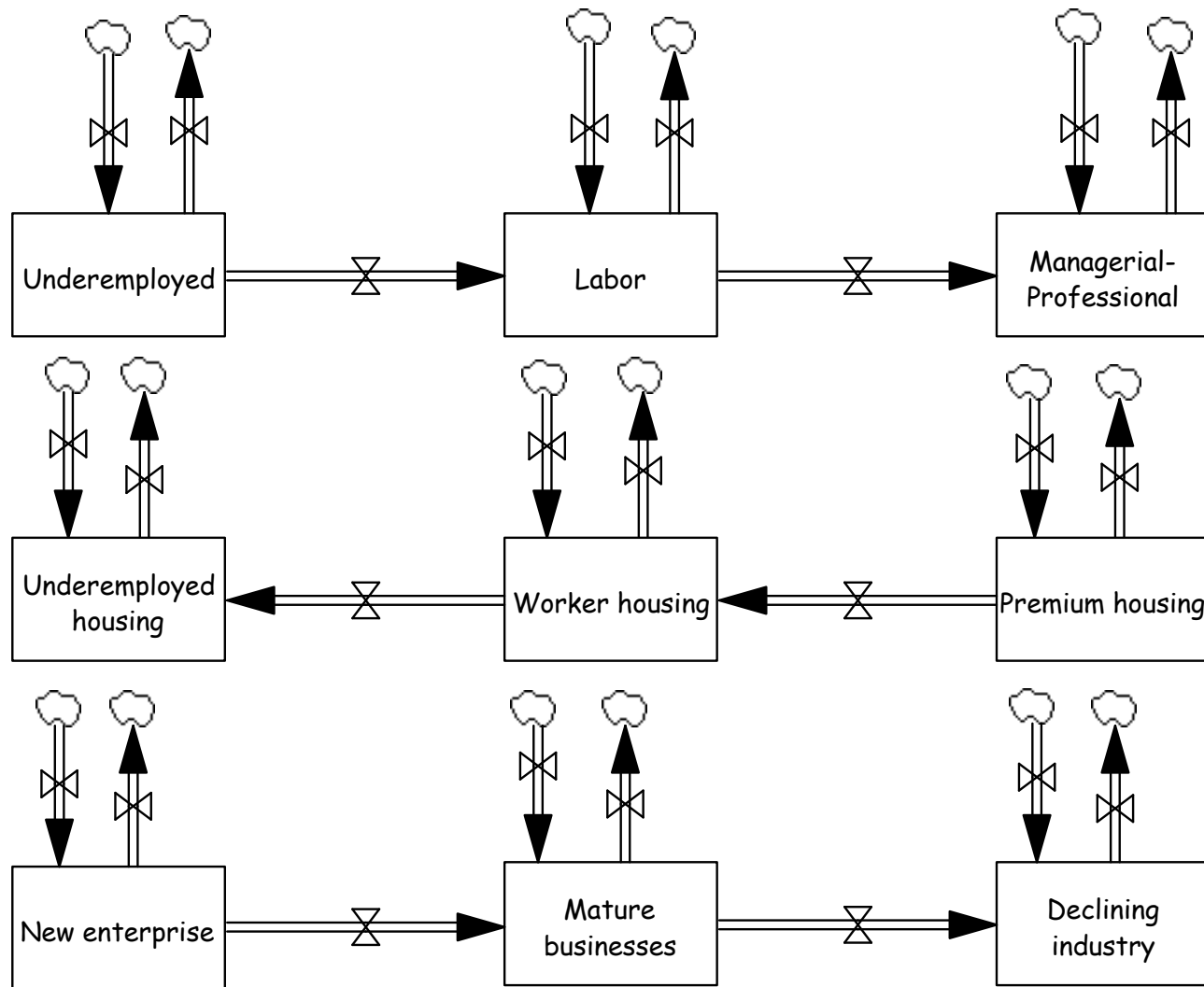


Dynamics of the Little Urban Model

Growth, Stagnation & Decline with High Unemployment

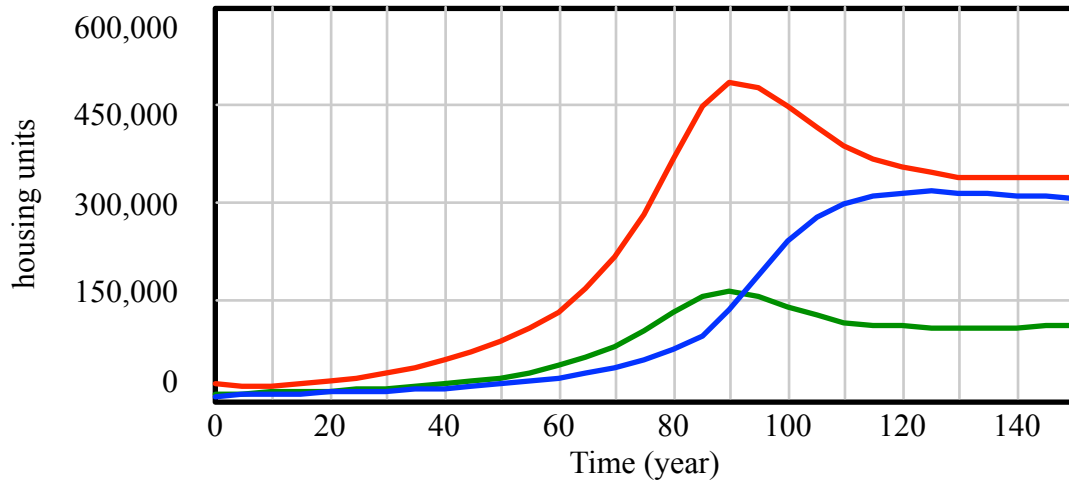


Forrester's *Urban Dynamics* Core Structure



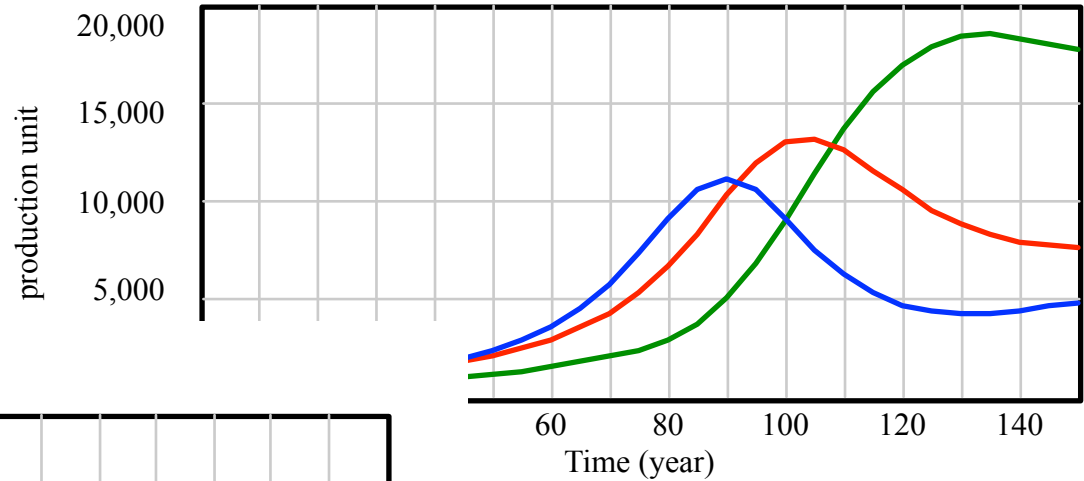
Urban Dynamics Key Stocks

Housing



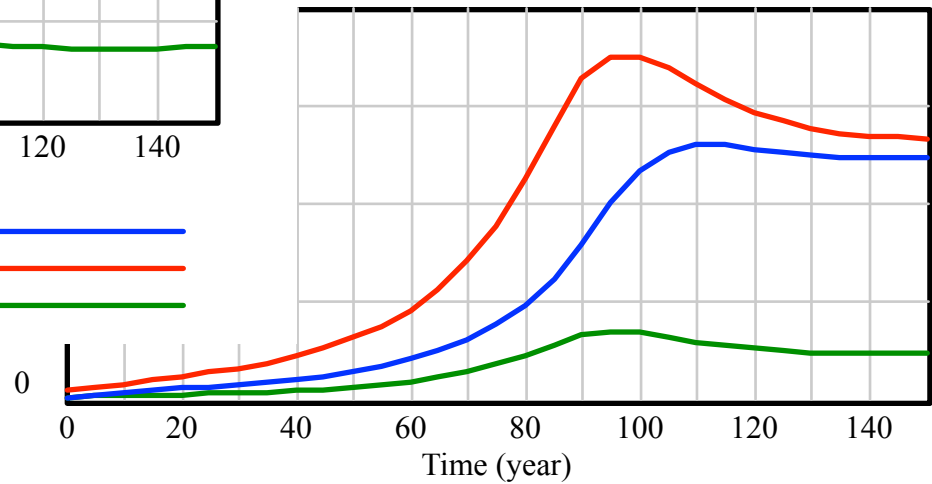
Underemp Housing : Urb Dyn base
 Worker Housing : Urb Dyn base
 Premium Housing : Urb Dyn base

Businesses



Underemp : Urb Dyn base
 Worker : Urb Dyn base
 Premium : Urb Dyn base

Populations

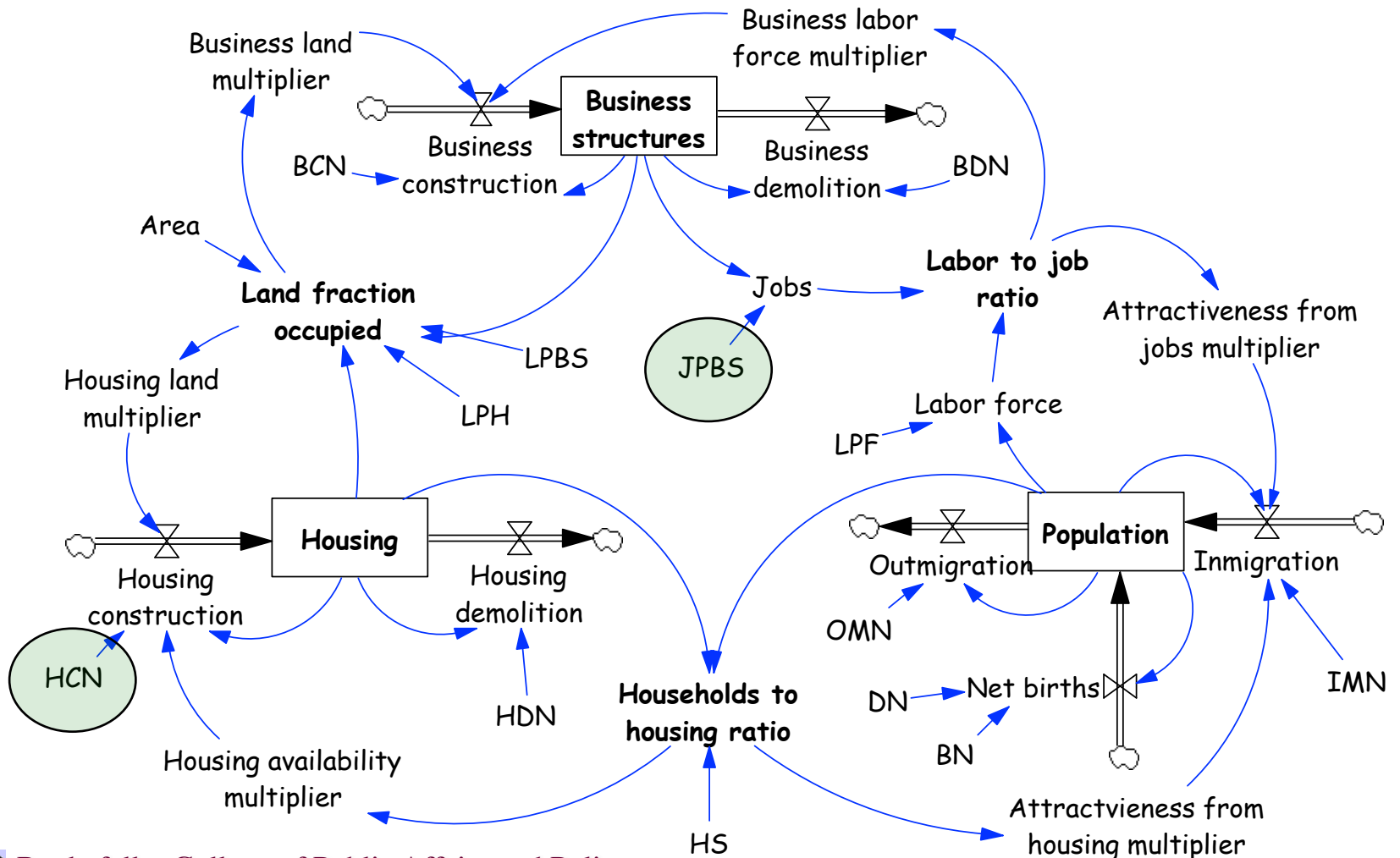


Underemployed : Urb Dyn base
 Labor : Urb Dyn base
 Manager Professional : Urb Dyn base



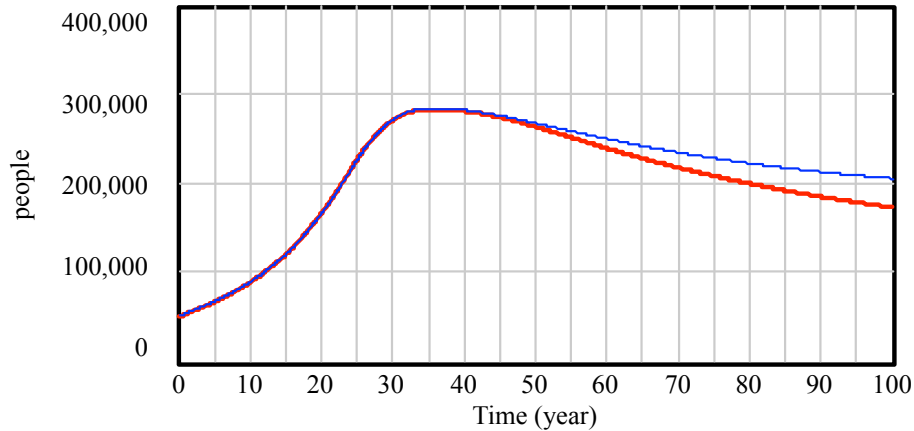
Favorite Policies in the 1960s

Low cost housing and Job programs



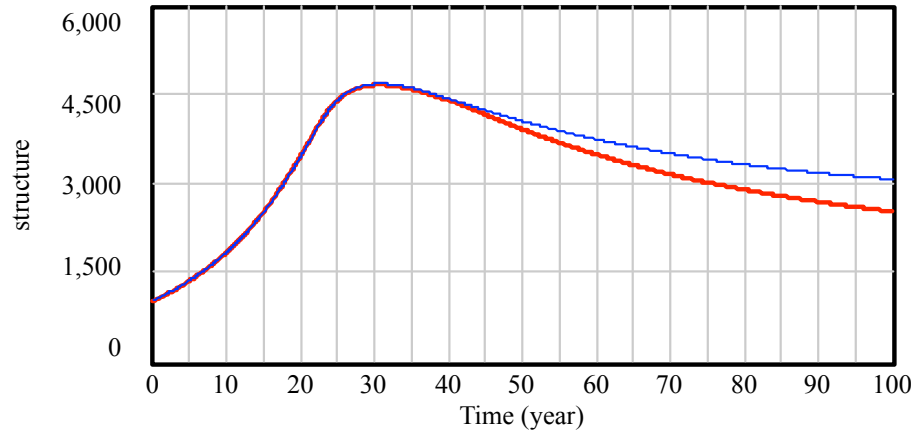
Building low cost housing ($t \geq 40$)

Population



Population : Urban1 —
Population : More housing constr —

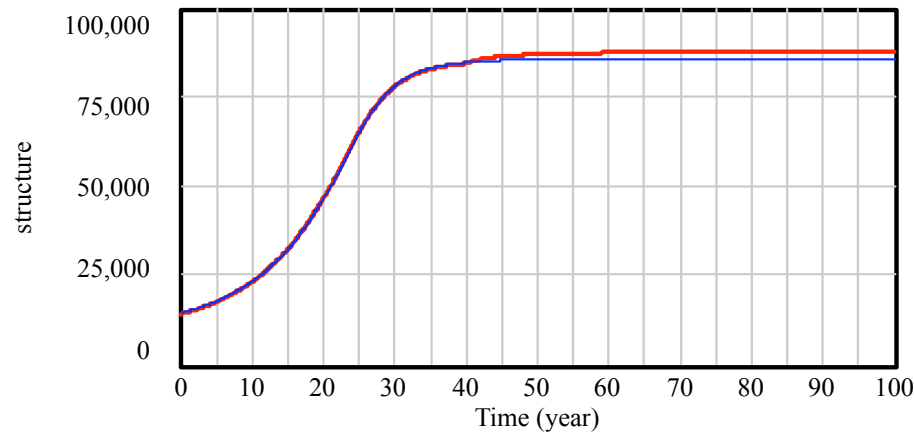
Business structures



Business structures : Urban1 —
Business structures : More housing constr —

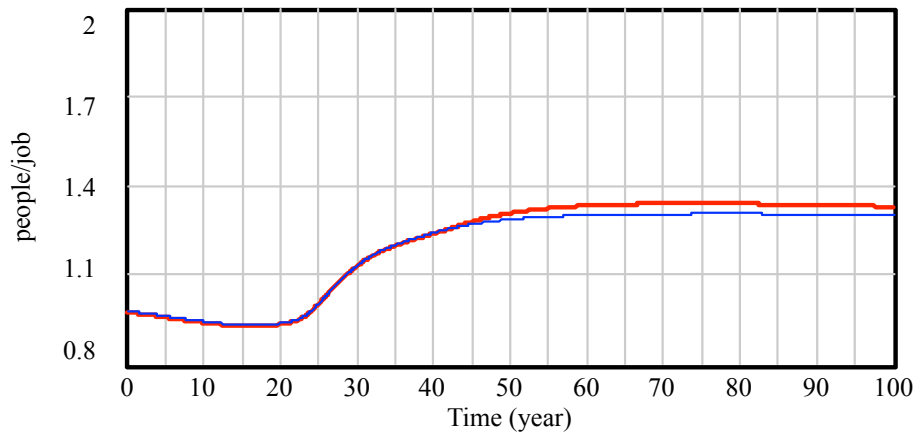
Little impact, no improvement

Housing



Housing : Urban1 —
Housing : More housing constr —

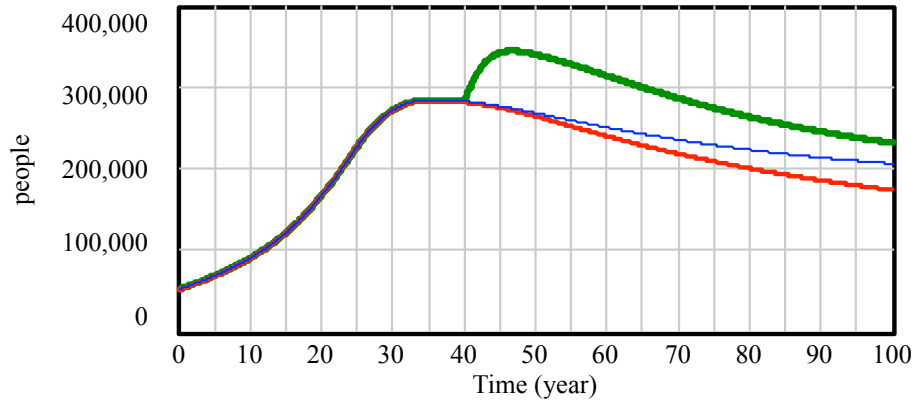
Labor to job ratio



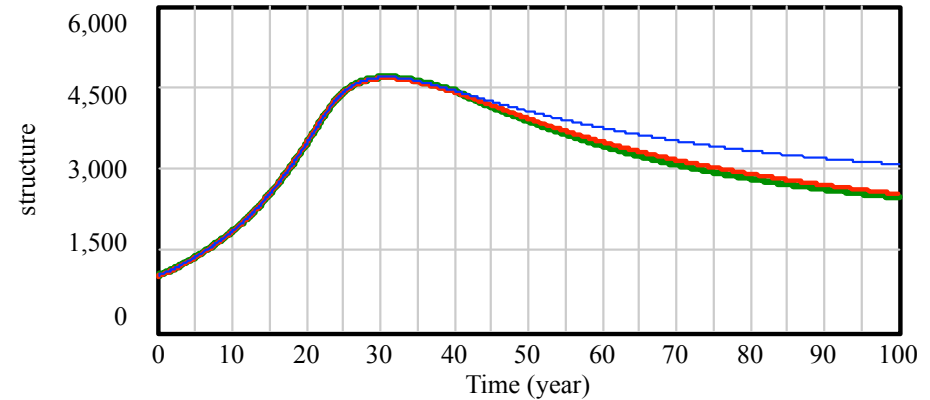
Labor to job ratio : Urban1 —
Labor to job ratio : More housing constr —

Wildly successful jobs program ($t \geq 40$)

Population

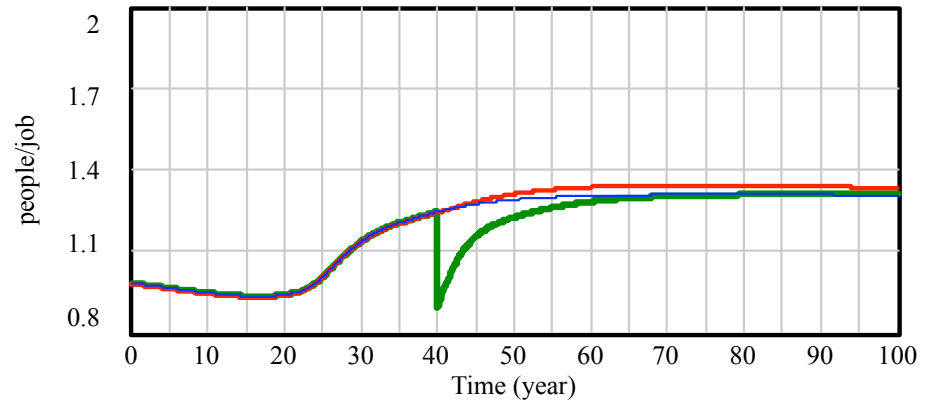
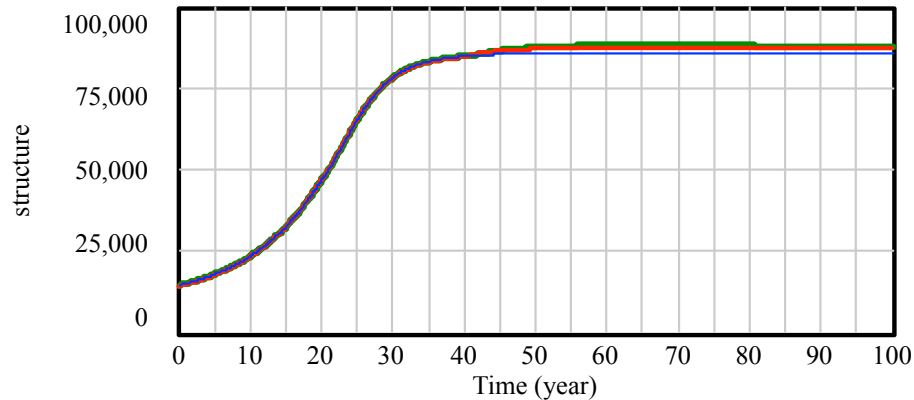


Business structures

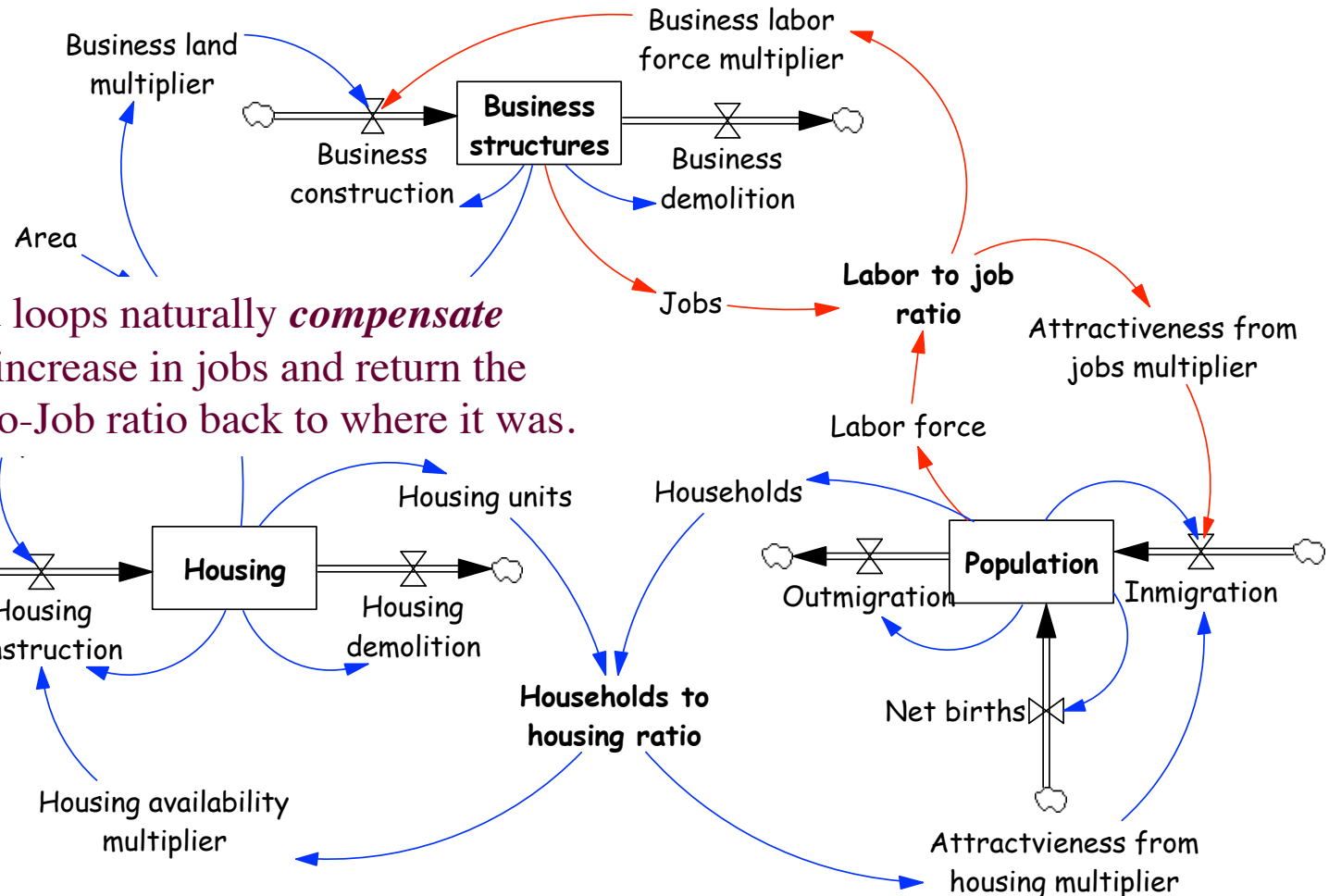


Short run benefit, no long run effect

Labor to job ratio



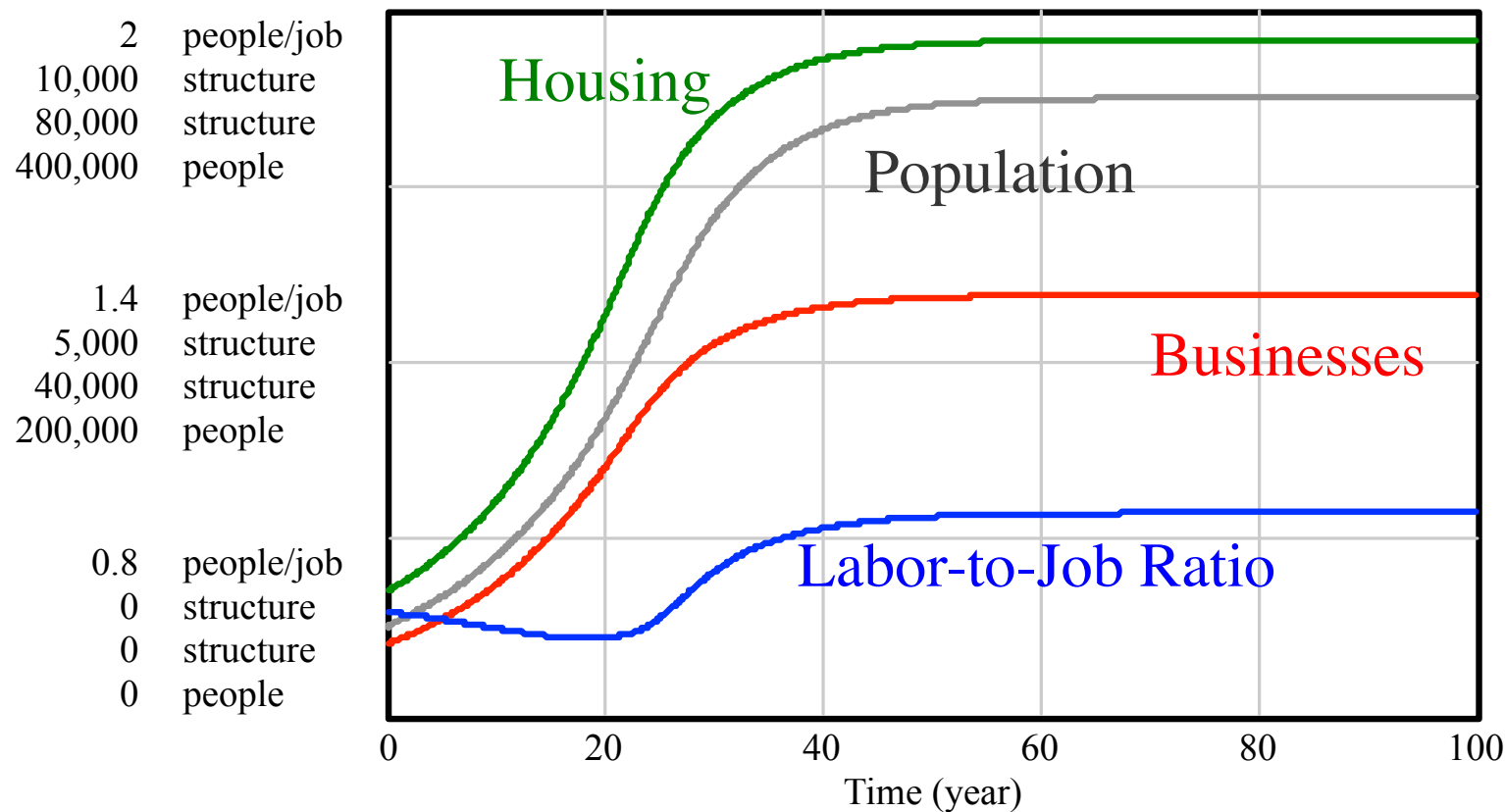
Why Doesn't the Jobs Program Work?



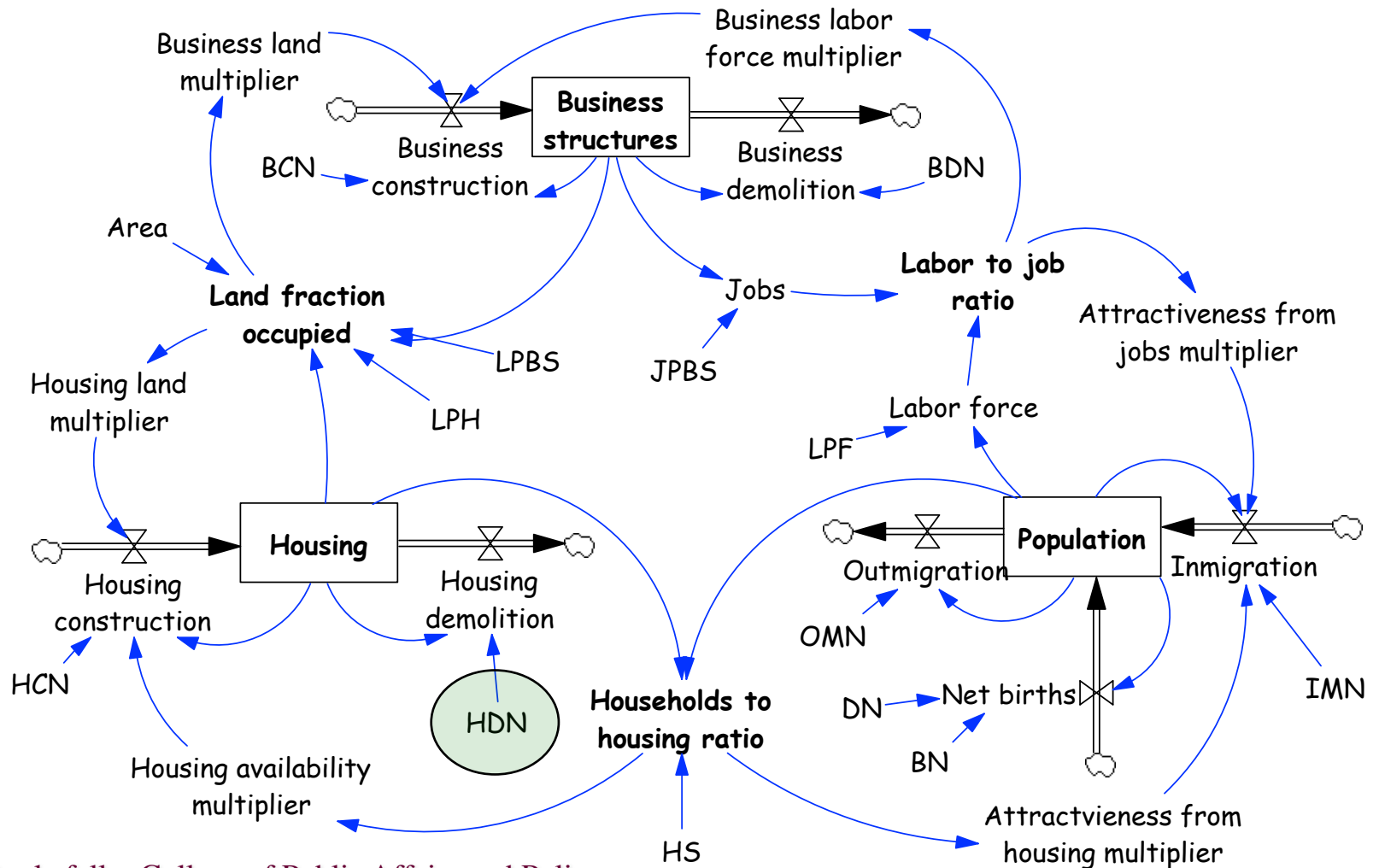
The red loops naturally *compensate* for the increase in jobs and return the Labor-to-Job ratio back to where it was.



What policies prevent urban decay and improve long run employment?

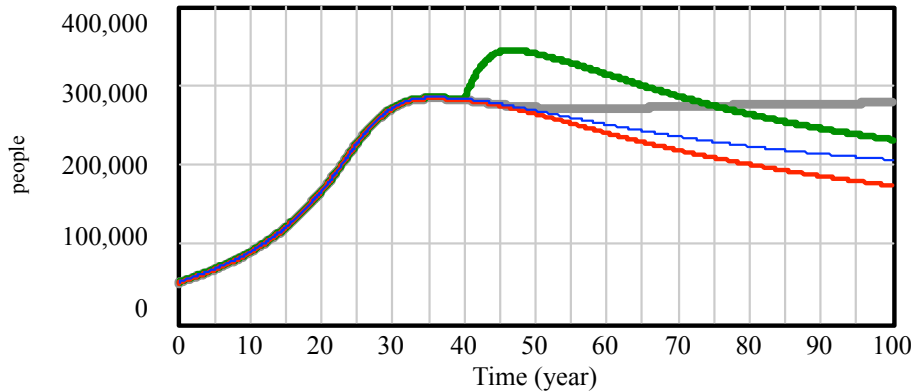


An unpopular policy: Knocking down housing



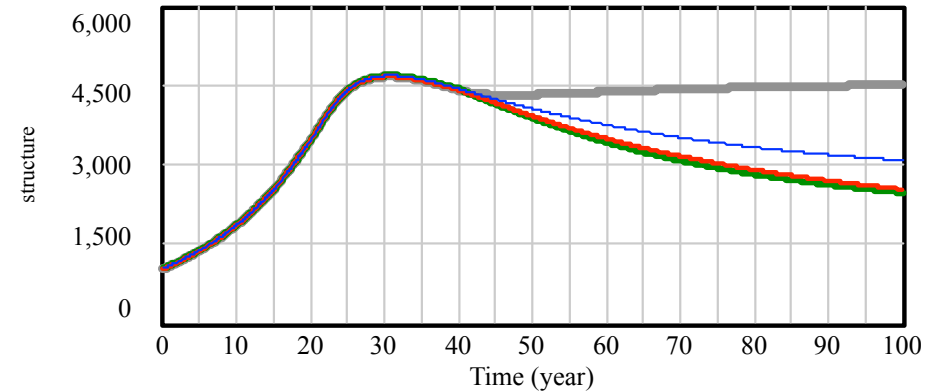
Housing demolition ($t \geq 40$) (Grey curves)

Population



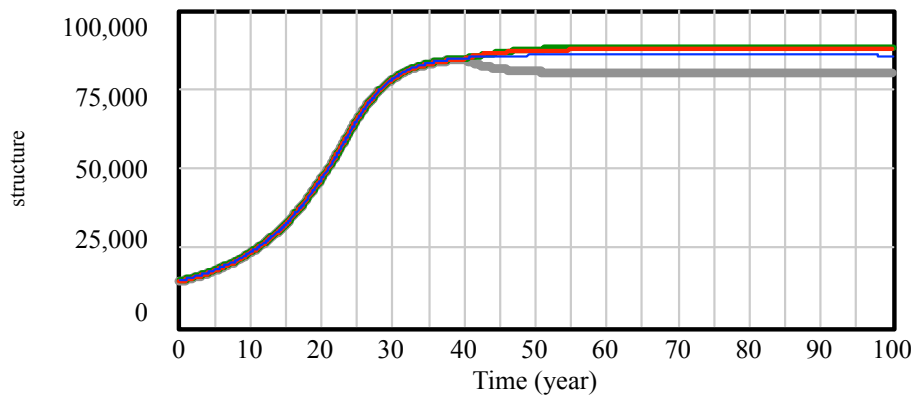
Population : Urban1
 Population : More housing constr
 Population : More jobs
 Population : Housing demolition

Business structures

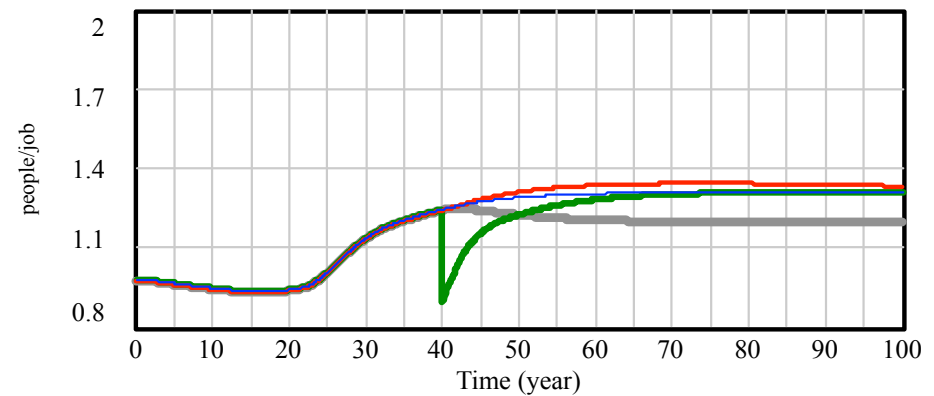


Business structures : Urban1
 Business structures : More housing constr
 Business structures : More jobs
 Business structures : Housing demolition

Housing **Makes things better! Why?** Labor to job ratio

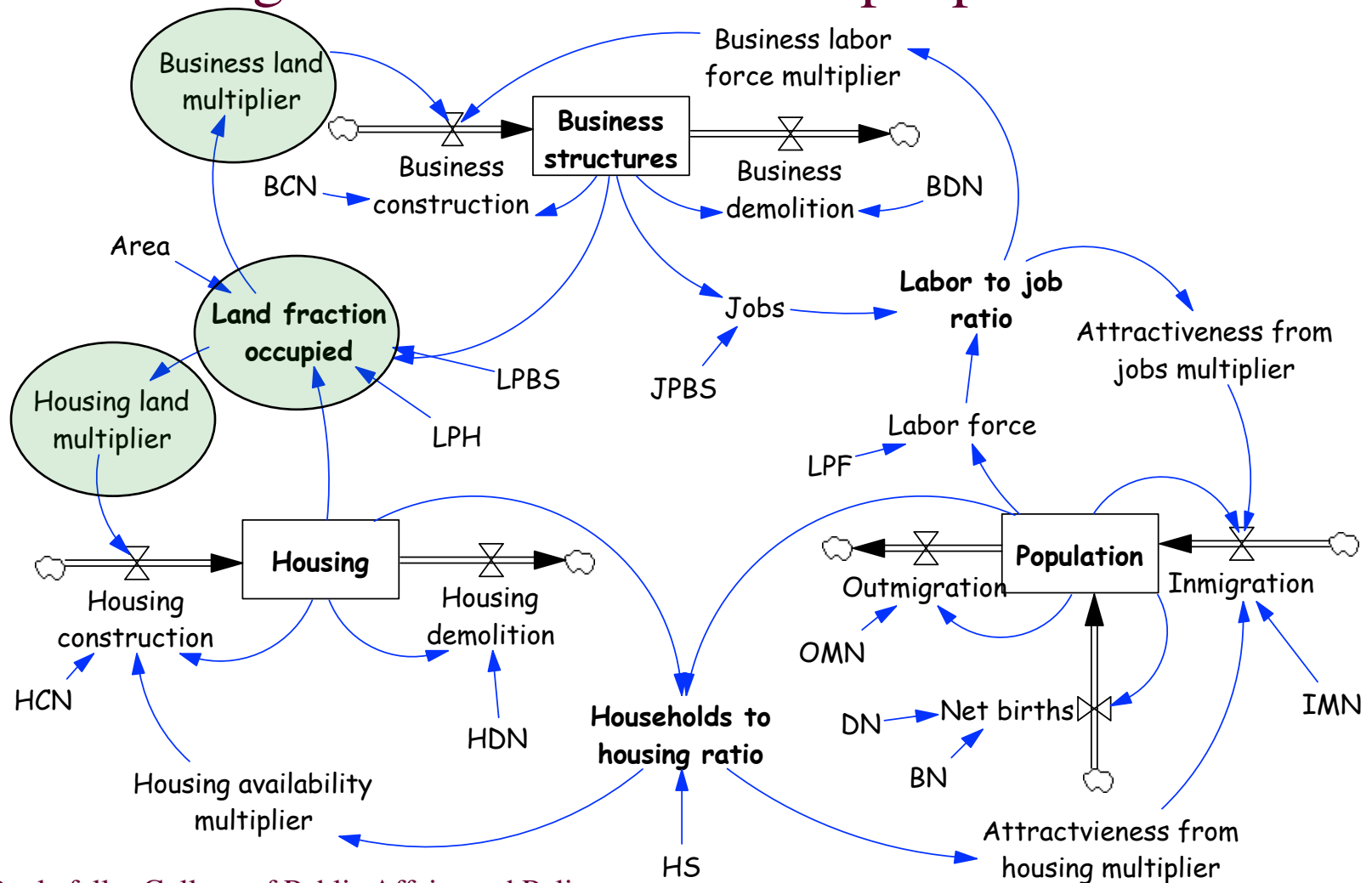


Housing : Urban1
 Housing : More housing constr
 Housing : More jobs
 Housing : Housing demolition

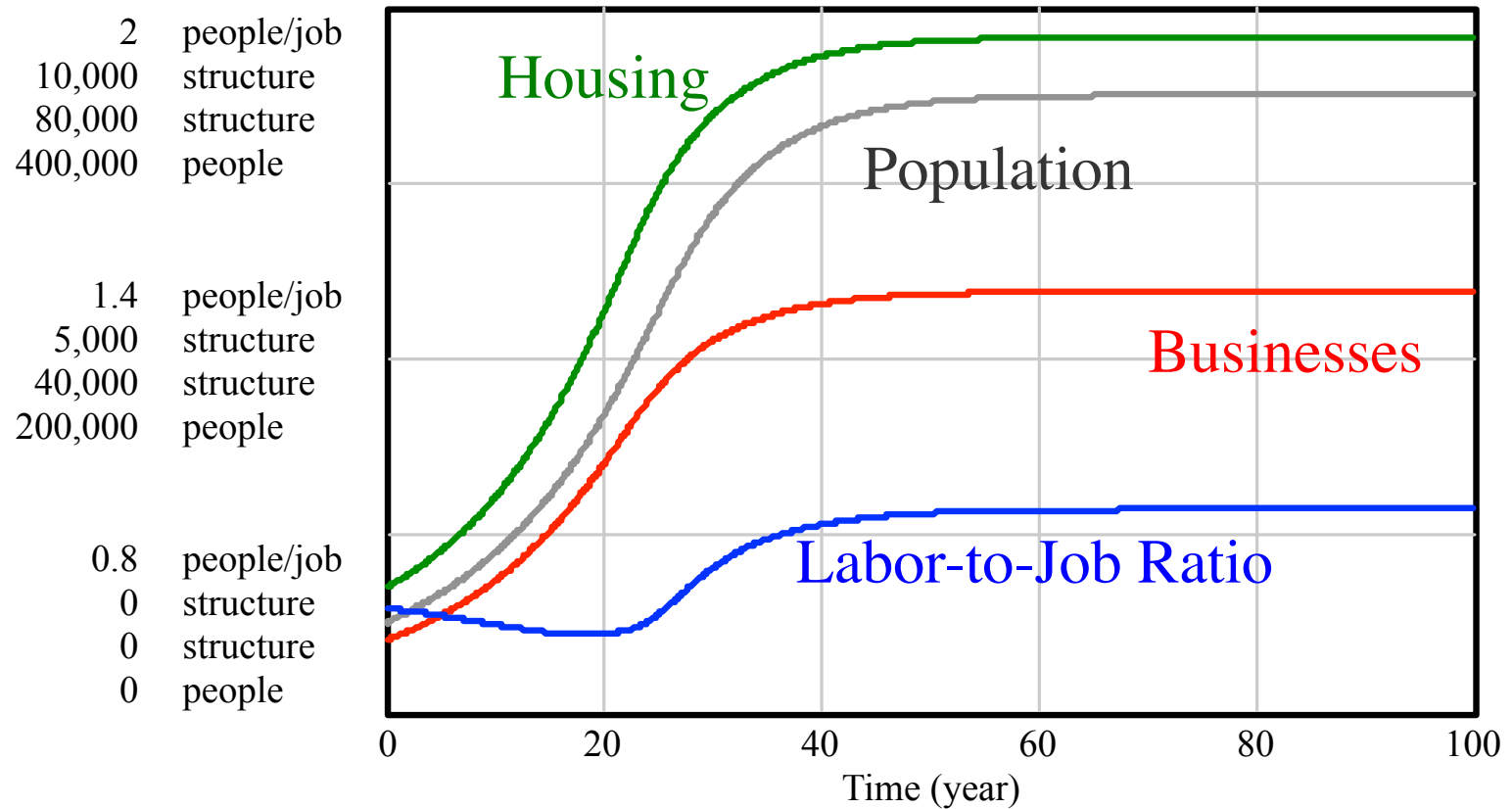


Labor to job ratio : Urban1
 Labor to job ratio : More housing constr
 Labor to job ratio : More jobs
 Labor to job ratio : Housing demolition

Another unpopular policy: Reducing our biases that favor “people” structures



Combined, the last two policies eliminate decay and lower unemployment



A Few Systems Thoughts

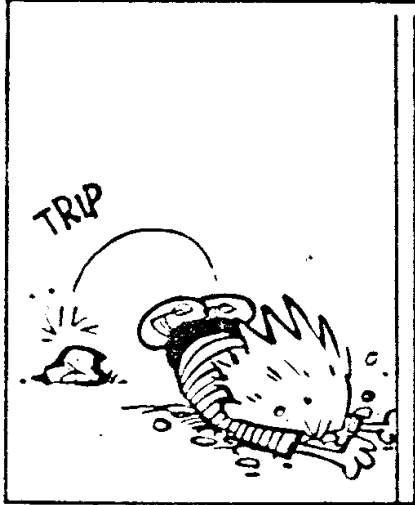
(Empirical results from sixty years of real-world system dynamics applications)

- Short run behavior often runs contrary to long run behavior
 - Better before worse, Worse before better
- High-leverage points in complex systems are hard to find
 - And if we find one, we usually push it in the wrong direction
- We usually think pretty well in causal *sequences*
 - We do not think well in causal *loops*
- We usually believe our problems are caused by outside forces
 - We'd rather not realize we cause or exacerbate our own problems
- A dynamic systems view doesn't make moral choices easier
 - But it makes them much clearer!



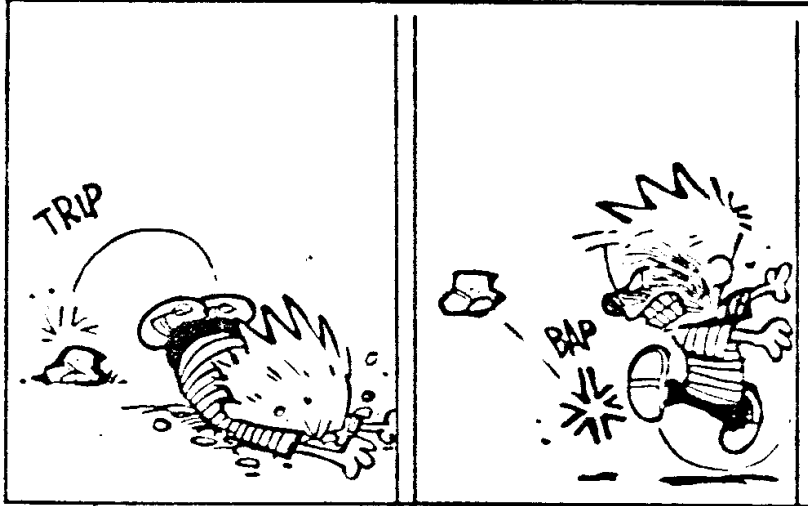
Policy Resistance of Complex Systems

CALVIN & HOBBS



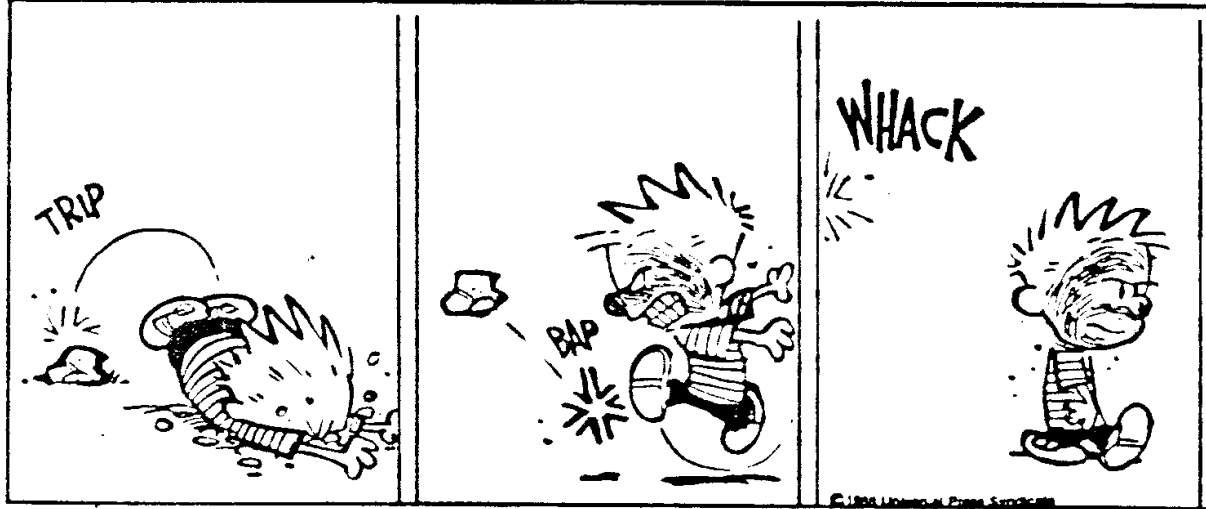
Policy Resistance of Complex Systems

CALVIN & HOBBS



Policy Resistance of Complex Systems

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Policy Resistance in Complex Systems

CALVIN & HOBBS

BY BILL WATTERSON



Final Thought

The Endogenous Point of View

Predominant Mode of Analysis

Exogenous Endogenous

Exogenous

Endogenous

True (Predominant) State of Affairs

