

# Growth and Fluctuations: An Overview

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# Some key mistakes of standard paradigm

- Equilibrium theories
- Based on overly simplified models
- With typically only one state variable
- Assuming rational expectations
- Models generate fluctuations related only to exogenous shocks

Alternative approaches do a better job both in providing insights and suggesting appropriate policy interventions

# Equilibrium theories

- Modern mathematical economics attempted to model itself off of 19<sup>th</sup> century *simple physics equilibrium* models
  - Paul Samuelson (1948) *Foundations of Economic Analysis*
  - Never had a good theory of dynamics—how the economy gets to the equilibrium (apart from mythical *tâtonnement* process)
    - Attempts to show stability in general equilibrium models were largely unsuccessful—stability required very restrictive conditions
    - Modern macro punted—just assumed that the economy would find the equilibrium, because otherwise the rational expectations conditions couldn't be satisfied
    - Though that might not be revealed for a very, very long time, in the absence of futures markets extending infinitely far into the future (Hahn, Shell-Stiglitz). They argued that the saddle point property in the absence of futures markets suggested a fundamental instability of capitalism; modern R.E. macroeconomists turned this on its head, saying that it established the uniqueness of the trajectory
  - But dynamics are central to understanding macroeconomics
  - Reasonable dynamics may generate fluctuations and instability

# Even 19<sup>th</sup> century physics went further than the simple equilibrium models

- Statistical mechanics tried to describe macro phenomenon from interactions of micro entities
- Modern macro with representative agent was only a scaling up of simplistic model—it was not about interactions
  - In that model, there were no markets
  - Robinson Crusoe is not a social science
- But interactions are at the core of economics (and any social science)
- So-called micro foundations based on maximization of utility and profits became a religion
  - Not justified by evidence (multiple paradoxes—like the dividend paradox, the executive compensation paradox)

# Interactions

- Once one starts modeling interactions one gets complex systems with interesting dynamics, including fluctuations
  - In these complex systems, hard to imagine how individuals could have R.E. of the future (see later discussion)
- Once one starts thinking about interactions of individuals, one has to think about power
  - Going beyond competitive model
  - Even in models with large numbers of agents
  - Robinson Crusoe had a power relationship with Friday
  - Macroeconomic models with market power behave differently than those without
    - Crucial role of rents (not just land rents, but monopoly rents)
    - Lowering interest rates may increase PDV of rents, with holdings of “Rent Capital” displacing real capital and lowering investment

# Market power and fluctuations

Can construct simple model akin to Goodwin model

- Real wages decrease with unemployment rate (real Phillips curve)
  - Investment (savings) decrease with real wages (workers consume a larger fraction of their income than capitalists—simple heterogeneity)
  - Employment increases with capital stock, which increases with investment
  - With fixed coefficients model generates Volterra-Lotka equations, generating a limit cycle
  - With more general production function, convergent oscillatory dynamics
    - But adding “shocks” may sustain oscillations (Akerlof-Stiglitz, 1967)
- Wide class of models (e.g. with credit rationing) generate similar results

# Based on overly simplified models

- Dynamics with a representative agent different from dynamics with heterogeneous agents
- Dynamics with heterogeneous capital goods different from dynamics with single capital good
  - Including putty clay and vintage capital models
  - Even with R.E. convergence to steady state may not be monotone (Cass-Stiglitz)
- Point should have been obvious—dynamics in one dimension different from two, different from three
- **Simple models may be helpful in giving some insights, but may be misleading**

# Overly simplified models

- Hirano-Stiglitz have shown in a R.E. OLG model with land (two state variables, the price of land and the capital stock) there are an infinite number of R.E. trajectories, and that the only R.E. trajectory may entail fluctuations—booms and busts
  - While there are an infinite number of paths, even from any particular  $\{P,K\}$  initial condition, we can say a lot about the trajectories—the boundaries of fluctuations
  - And show how those boundaries change with policy and parameters



# Rational expectations

- Doesn't describe the economy—how can one have R.E. in an ever-changing economy?
  - How could one have anticipated 9/11, the financial crisis, Trump and the deglobalization that followed, the pandemic, or October 7 and all of its consequences?
  - These are the events that matter
  - Associated with deep uncertainty
- The fact that there is deep uncertainty doesn't mean we can't say a lot about the economy
  - Dynamic disequilibrium models with noise (with Martin Guzman)
  - Importance of precautionary behavior, macroeconomic externalities

# The question of how individuals and firms form expectations is an important one

- But using *better* linear estimators in a highly non-linear complex may neither lead to higher profits of the firm or, when many firms engage in this “more rational” behavior, better performance of the economic system (Dosi *et al*)
  - Simpler systems may perform better—less is more

# The economy obviously fluctuates

- So what's the source?
- Internal dynamics (as in some of the models already described)
- Exogenous shocks
- But to explain much of the empirical evidence, the only exogenous shocks that work are those to the *aggregate production function*
  - What are the negative shocks? What does it mean to have a reduction in productivity? Collective amnesia about how to produce?
  - More plausible to generate fluctuations in the rate of growth of technology
    - Can construct models of innovation where internal dynamics lead to fluctuations in rates of growth—with sometimes negative growth
    - That was the important contribution of Dosi's Schumpeter plus Keynes model
  - But then one has to have an endogenous theory of technology
  - And that naturally leads to theories of imperfect competition
- Should be obvious that many of the key disturbances are endogenous shocks
  - 2008 financial crisis

# Alternative theories

- Already mentioned several
- Key problem of the economy: it's complex
- We've come to accept that climate is complex, and can only be understood with "big models"
  - But still, some of key determinants can be simply explained
- Still a role for simple models to help understand some parts of what is going on
  - Assumptions of competition, R.E., representative agent in each generation, single capital good in Hirano-Stiglitz: still instructive to see how such a simple model can still generate fluctuations; need to identify the "forces" at play

# Alternative theories

- If we were to start economics from the beginning now, we would turn to evolutionary biology, not 19<sup>th</sup> century physics
  - Describing the determinants, processes of evolution
  - Recognizing that we can't really predict the next mutation
- In the end, we will need to have model with interacting agents, interacting in markets and networks, with deep uncertainty, with imperfect markets, with endogenous innovation—in an ever-evolving economy
  - Giovanni has led the way in developing these models and opening up new frontiers in economics