

# Course in Heterogeneity and Fluctuations

## I: Reassessing the Role of Heterogeneity for Business Cycles

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August, 2019: University of Oslo

# HETEROGENEITY AND INEQUALITY ARE A SIGN OF THE TIMES





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  - Family Formation
  - Health and Longevity
- But as Macroeconomists, should we care?





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  - It requires an unsuitably large Frisch Elasticity of Labor to move employment.
  - There is a lot of wealth that can be used efficiently to weather changes in available resources.
- The Great Recession has highlighted its shortcomings: How come we got such a large recession.

# NEOCLASSICAL HETEROGENEOUS AGENT & BUSINESS CYCLES



AIYAGARI-BEWLEY-HUGGETT-IMROHOROLU MODELS WITH AGGREGATE SHOCKS



- Heterogeneous Households only (just for this talk).

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- Heterogeneous Households only (just for this talk).
- Why could they generate larger fluctuations?
  - First set of Empirical Reasons
    1. Recessions hit (lower earnings, more unemployment) more vulnerable (poor) households more.
    2. Poor households have a higher Marginal Propensity to Consume out of income than rich households Johnson, Parker, and Souleles (2004), Misra and Surico (2014).



Heterogeneity (Inequality) in 2006:  
Marginal Distributions

	y	c	a	SCF 07 a
Mean (2006\$)	62,549	43,980	291,616	497,747



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Top 1%	8.0	8.2	30.9	33.5



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- a: Bottom 40% holds basically no wealth
- y, c: less concentrated

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a	% Share of:		Exp.Rate c/y (%)
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- 80% poorest account for 63% of consumption

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  - 3.2 A lot of agents in the states where their behavior is non linear (close to zero cash in hand).



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  2. Moreover, most agents are in the essentially linear part of the state space
- Heterogeneous agents models are like Rep Agent models for business cycle purposes. Also confirmed in life-cycle models.

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  2. Enough Low wealth people
  3. Large enough shocks

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- Unemployment insurance system with size  $\rho = 50\%$ .

## INEQUALITY IN THE BENCHMARK ECONOMY

Net Worth	Data		Model
	PSID, 06	SCF, 07	
% Share held by:			
Q1	-0.9	-0.2	0.3
Q2	0.8	1.2	1.2
Q3	4.4	4.6	4.7
Q4	13.0	11.9	16.0
Q5	82.7	82.5	77.8
90 – 95	13.7	11.1	17.9
95 – 99	22.8	25.3	26.0
Top 1%	30.9	33.5	14.2
Gini	0.77	0.78	0.77

- Get's inequality almost right at the very bottom

## JOINT DISTRIBUTIONS (2006): DATA V/S MODEL

a Quintile	% Share of:				%c/y	
	y		c		Data	Model
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Q1	8.6	6.0	11.3	6.6	92.2	90.4
Q2	10.7	10.5	12.4	11.3	81.3	86.9
Q3	16.6	16.6	16.8	16.6	70.9	81.1
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- But Still **overstates consumption and saving rates of the rich.**
- Rudimentary life cycle is crucial for level of consumption rates and their decline with wealth.

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- Still Relative Minor Action.
- If we were to think of Endogenous Labor, it would be Worse (Guerrieri-Lorenzoni-2009)



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## A PARALLEL STORY WITH NEW KEYNESIAN MODELS

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- The main feature is to imply a slightly larger drop in consumption to that in Rep agent Models.



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  3. Expenditures play a role in productivity
  4. Sectoral Reallocation is costly: Nontradables to tradables.
- These margins open the door to other type of shocks (financial shocks, government policy shocks, international shocks).

## A SECOND UPDATE: HETEROGENEITY AND THE NEW MARGINS

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- Asset Holdings

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- Expenditures play a role and adjustment is costly.
  - These are mechanisms that transform a drop in consumption into drops in TFP without reallocation of output to investment. Triggered by drops in Consumption.

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- Most of consumption is non tradable and non investable.



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- Households assets are in houses and/or in financial assets with a collateral constraint.

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$$V(\epsilon, e, a) = \max_{c_i, I_N, h, d} u(c, h, d) + \beta \sum_{\epsilon', e', \theta'} \pi_{\theta, \theta'}^\theta \pi_{e'|e, \epsilon}^w \pi_{\epsilon, \epsilon'}^\epsilon V[\epsilon', e', a'(b, h)] \quad \text{s.t.}$$

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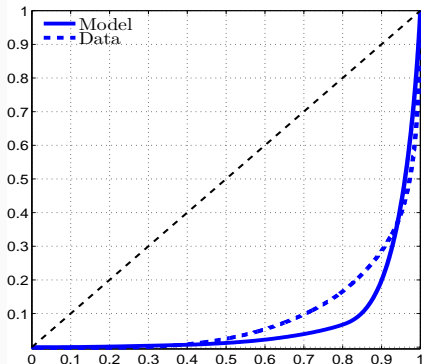
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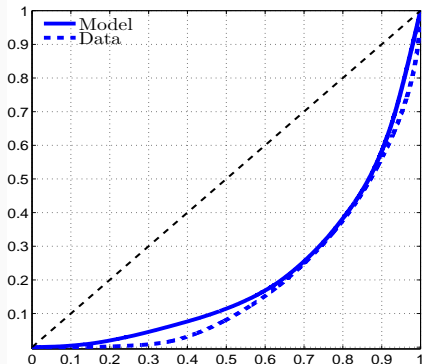


# A GLIMPSE: LORENZ CURVES OF NET WORTH AND HOUSING

Network



Housing



# **1          Putting the Model to Use:                  An Experiment**



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- We look at the transition. It involves solving for the steady state and then iterating backwards (with the additional problem of solving for equilibrium prices. Hard, but not too hard. Dynare can do it.)



## EXPERIMENT: TIGHTENING OF CREDIT

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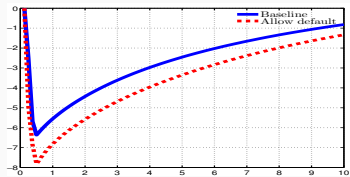
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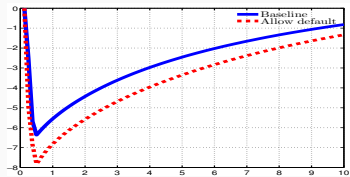
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- Like in all heterogeneous agents models, more frictions imply that in the long run output and wealth end up being higher.
- But in our economies the transition is associated to a recession.

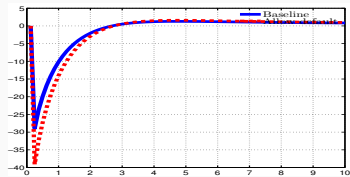


Consumption

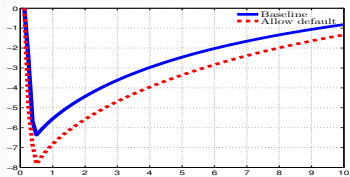




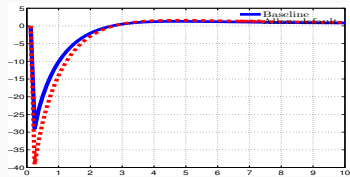
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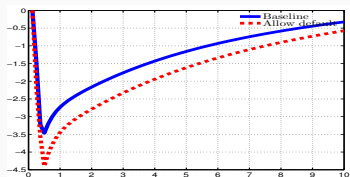
Investment



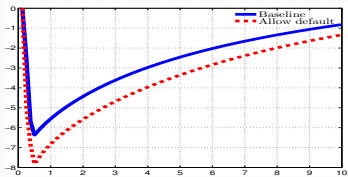
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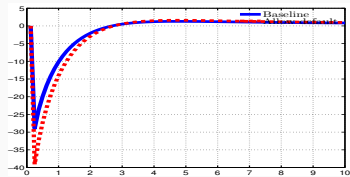
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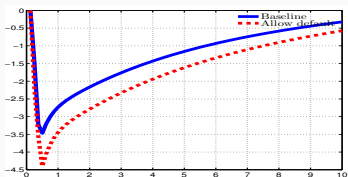
Output



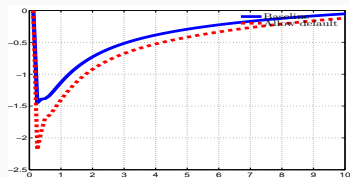
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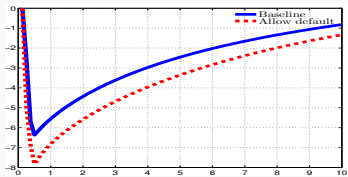
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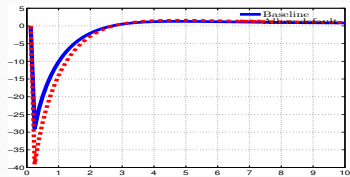
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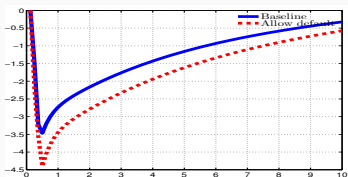
TFP



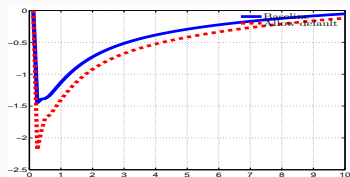
Consumption



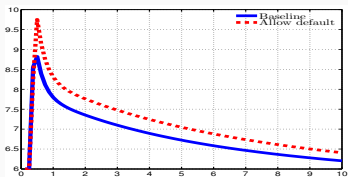
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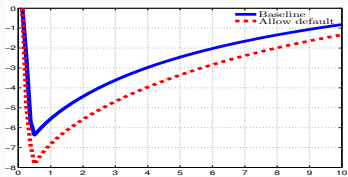
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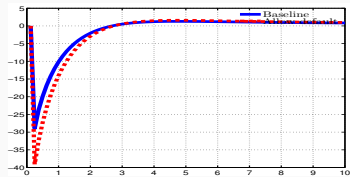
TFP



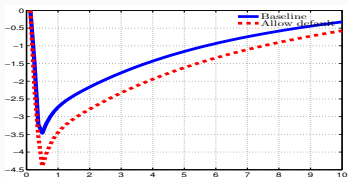
Unemployment rate



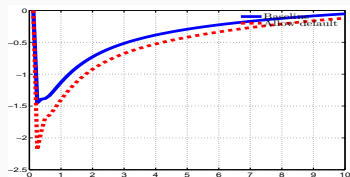
Consumption



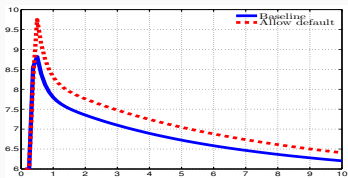
Investment



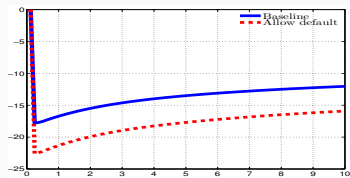
Output



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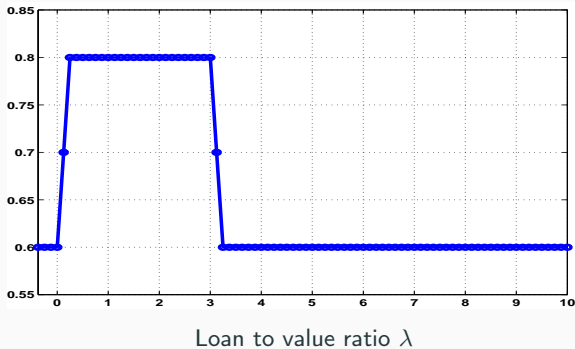


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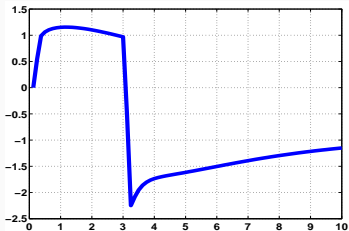


Housing Prices

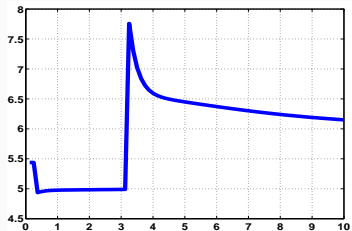
# WHAT ABOUT EXPANSIONS?: A CREDIT CYCLE



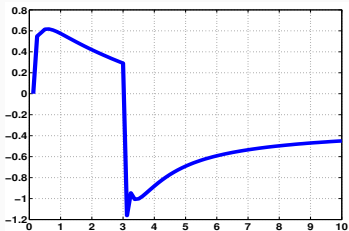
# ANOTHER EXPERIMENT A CREDIT CYCLE



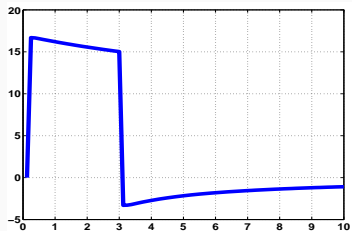
Real output



Unemployment rate



TFP



Housing price

## WHAT ABOUT STANDARD ANALYSIS OF FLUCTUATIONS?

- MIT shocks are NOT the way to study fluctuations.
- Traditionally very complicated methods have been proposed. Some of them based on *quasilinearity* or aggregate capital is the only thing that matters (Krusell and Smith (97,98)) interesting really happens. There are modern linearization versions based on Reiter such as Ahn et al. (17) and Childers (17).
- They approximate somehow the distribution of agents and look for its equilibrium law of motion.



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$$\hat{x}_t = x_0\epsilon_t + x_1\epsilon_{t-1} + x_2\epsilon_{t-2} + \dots$$

- And we are done!!!!

## BUT WE CAN DO A LOT BETTER THAN THAT

- There is a wonderful recent innovation Boppart, Krusell and Mitman (17) that uses the Impulse Response from an MIT Shock as a Numerical Derivative to evaluate linear approximations.
  - Only the transition to one (or more) MIT shock needs to be computed.
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- And we are done!!!!
- Adding more shocks is linearly more costly

## 2 Conclusion



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- The Cost of using this type of models is much lower than before.
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- Not only Heterogeneity of households but of firms and financial entities.

Thank You for Coming and  
Listening!