Reassessing the Role of Heterogeneity to Understand Business Cycles

José Víctor Ríos Rull

With material developed jointly with Zhen Huo and by Dirk Krueger

University of Pennsylvania

Workshop on Central Bank Models: The Next Generation
Session III: Challenges to the Business Cycle Paradigm in Central Bank Models
November, 2016
Heterogeneity and Inequality are a Sign of the Times
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- It has increased a lot recently with hard to predict consequences.
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- It permeates many facets of life:
  - Consumption
  - Politics
  - Migration
  - Family Formation
  - Health and Longevity
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- But as Macroeconomists or Central Bankers should we care?
DSGE are Representative Agent Models

Aggregate Consumption comes from the Interaction of:

- Euler Equation
- Price Rigidities
- Monopolistic Competition in Goods Markets

The Great Recession has highlighted their shortcomings:

1. Consumption is not affected by Wealth Effects.
2. Poor Integration with Financial Stability and Housing Prices.
3. Insufficient feedback of Expenditures to Productivity.
4. Poor representation of real rigidities.
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Ríos Rull (Penn) Reassessing the Role of Heterogeneity Central Bank Models
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Using Neoclassical Heterogeneous Agent Models & Business Cycles
Aiyagari-Bewley-Huggett-Imrohoroglu models with Aggregate Shocks

They can generate large fluctuations in Consumption

They are immediately consistent with empirical facts

Recessions hit (lower earnings, more unemployment) more vulnerable (poor) households more.

Poor households have a higher Marginal Propensity to Consume out of income than rich households.

Poor households have almost no wealth.

Middle class households are very leveraged.
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Neoclassical Heterogeneous Agent Models & Business Cycles
Theoretical Mechanisms within narrowly defined neoclassical models
Mostly Models of Employment not of Hours: Misery is concentrated.
1. Mostly Models of Employment not of Hours: Misery is concentrated.

2. They do have poor, yet mobile, households (those that consume most of their income).
In Early Versions: Heterogeneity does not matter

Krusell Smith (1997-98) found Quasilinearity. Heterogeneous agents models are like Rep Agent models for business cycle purposes. Also confirmed in life-cycle models.

Small Role of Wealth Effects in the early models

▶ Agents have plenty of wealth (even in high wealth dispersion models due to $\beta'$s differences).
▶ The impact of recessions was small on all agents: Unemployment is short lived and lives no scars and earnings dispersion does not go up in recessions.
▶ Wealth does not disappear in recessions (it is capital).

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- **Augmented** Krusell and Smith (1998)

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| $\Delta C$   | -1.9% -2.9% -2.4% |

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Taking Stock

Still Small Effects of Modelling Heterogeneity even with a Silly Theory of the Great Recession (4% TFP drop)

Small Response of household Consumption.

Automatic Stabilizers do their job (smaller role of Heterogeneity)

Other margins (investment, labor) not clearly helped by household Heterogeneity.
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3. Other margins (investment, labor) not clearly helped by household Heterogeneity.
Where do we go from here

There are still three margins that when combined with inequality can give us the possibility of larger fluctuations. Assets are not very liquid (Kaplan et al. (2016)). Wealth disappears: We need to model wealth differently than accumulated output: Asset Prices that can move dramatically. Expenditures play a role in productivity and reallocation is costly. These margins open the door to other type of shocks (financial shocks, government policy shocks, perception shocks) to make up for TFP or markup Shocks.
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Liquidity of Assets

The portfolio composition of households of different wealth levels is very different. Liquidity is a property of asset type. Models should replicate portfolios by wealth levels.

Wealth Destruction

In Rep Agent Models assets are priced by their shadow value. Proper movements of assets (houses) should include transactions and a theory of their determination. Moreover, Bankruptcies destroy wealth and redistribute wealth. (Hedlund various papers, Head, Lloyd-Ellis & Sun (14), Huo & Rios-Rull (14), Kaplan, Mitman & Violante (16), Head, Sun & Zhou (15)).

Expenditures play a role in productivity and adjustment is costly.

Mechanisms that transform drops in expenditures into drops in TFP. Reallocating inputs used in Consumption or Housing Construction into Exports or Investment in Equipment is difficult.
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  6. Households can go bankrupt: lenders lose.
A (MIT) financial shock: Tightening of credit

1 An Economy with Default

- Over three months the down payment changes from 20% to 40%
- The borrowing interest rate’s surcharge goes from zero to 1.%

2 Long Run Properties

- 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.
Output

Consumption

Investment

TFP

Unemployment rate

Housing Prices
A Parallel Story with New Keynesian Models

Heterogeneous Agent environments have also been used in New Keynesian environments and some of the same findings go through:

▶ Kaplan et al. (2016)
▶ Luetticke (2015)
▶ Bayer et al. (2015)
▶ McKay and Reis (2016)
▶ Ravn and Sterk (2012)
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These models pose Household Heterogeneity in the context of models suited for the study of Monetary Policy. They still need wealth destruction and effects on productivity.
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The Effects of Policy are not uniform across people.

Gornemann, et al. (2016)

- Boosting household lending is not the same as interest rate changes.
- The trade-offs between Employment and Inflation are very different for various income, age, and education groups.

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Reassessing the Role of Heterogeneity

Central Bank Models
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What About Costs?

Traditionally, it was very cumbersome to solve these models. New developments (Winberry (16), Childers (16), Reiter, Algan et al) have made it much easier. In fact, Dynare can be used to solve them. This is the standard tool in using models for business cycles. It uses MATLAB and can be run by research assistants once the stationary version is constructed with all kinds of shocks.
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Conclusions

We should use routinely Heterogeneous Agents Models to study fluctuations.

▶ Consumption is more responsive to Economic Conditions.
▶ Asset (housing) trades generate sharp changes in wealth.
▶ They have to include other features that complement Heterogeneity
  ⋆ Reallocation Frictions
  ⋆ Endogenous TFP
  ⋆ Some form of Wage Rigidity

The Cost of using them is much lower than before.

Provide natural environment for new mechanisms
Disagreement in forecasts (Huo (16), ).

Not only models with Heterogeneity of households but also of firms and financial entities should be part of the Central Bank's arsenal of analytical tools.
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Conclusions

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- Not only models with Heterogeneity of households but also of firms and financial entities should be part of the Central Bank’s arsenal of analytical tools.
Thank You!