

The Housing Sector over Business Cycles: Empirical Analysis and DSGE Modelling

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This presentation is based on the CNB Working Paper 12/2014

Research Open Day
Czech National Bank, 18 May, 2015

Goals of the paper

We analyse the dynamics of the housing sector over business cycles:

1. Empirical analysis of cyclical properties of the housing market data
 - 1.1 on a sample of advanced economies,
 - 1.2 for the Czech economy.
2. We develop a cascade of DSGE models:
 - ▶ Are standard *supply and demand mechanisms* sufficient to mimic cyclical properties of housing market data?
 - ▶ YES, they can!.

Motivation

DSGE models with housing are dominated by the Iacoviello-Neri (2010) framework with collateral-constrained households:

- ▶ empirical supports for the collateral effect is weak in **microeconomic studies** (at least in European studies that distinguish households with various type of house ownership):
 - ▶ this was confirmed for the Czech case by a study by Brůha, Hlaváček & Komárek (2013).
- ▶ We find macro support **▶ weak** as well!
- ▶ Policy implications are crucially dependent on whether:
 - ▶ exogenous house price changes *cause* macroeconomic fluctuations, or
 - ▶ whether movements in house prices are mere *symptoms* of business cycles.

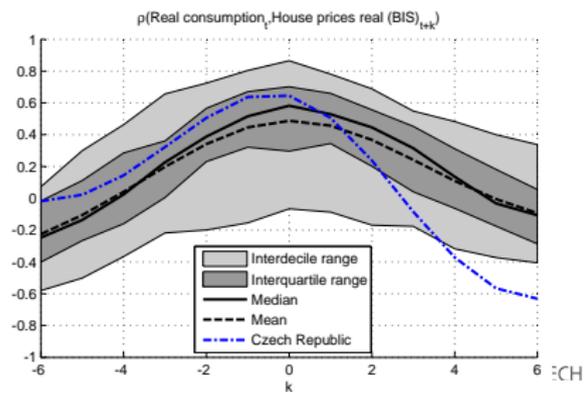
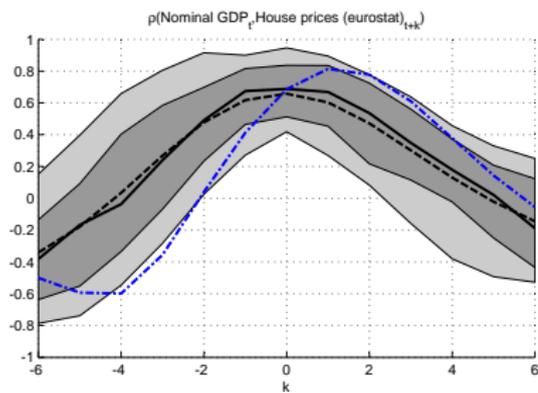
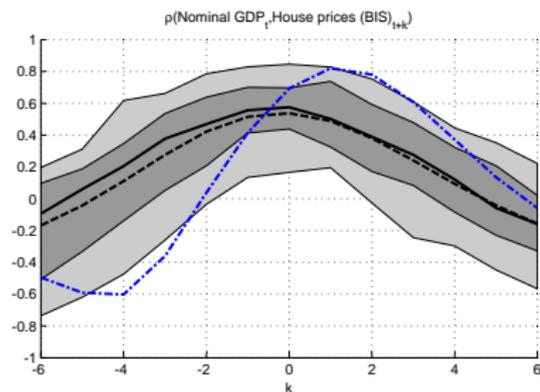
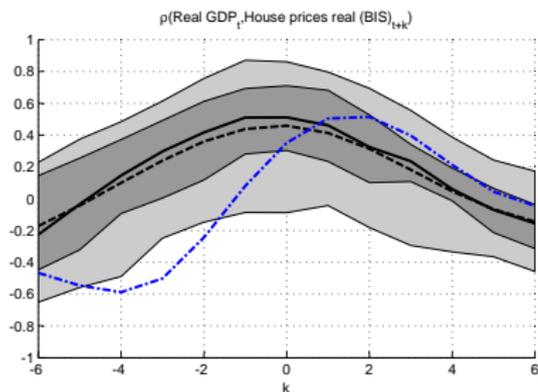
Stylised facts

First, we attempted at establishing stylised facts on the cross-section of market-based economies:

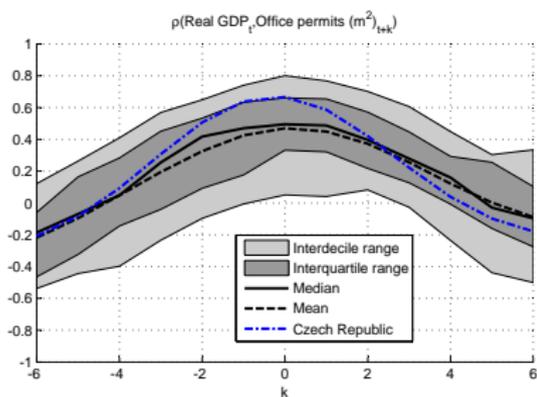
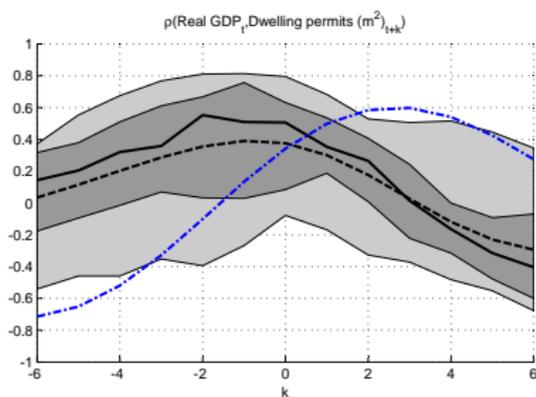
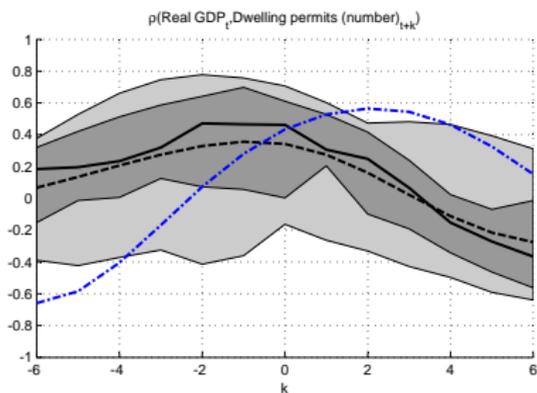
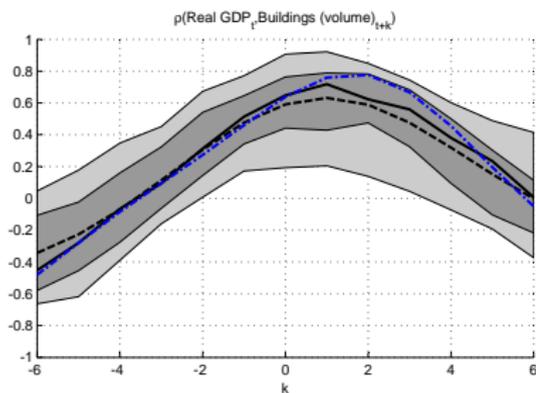
- ▶ We collected several data sources on property prices (Eurostat, BIS dataset, Dallas FED datasets)
- ▶ Data on National Accounts (Eurostat, IMF)
- ▶ Sectoral data – construction sector (output, labour inputs): Eurostat

and then seeks for stable patterns.

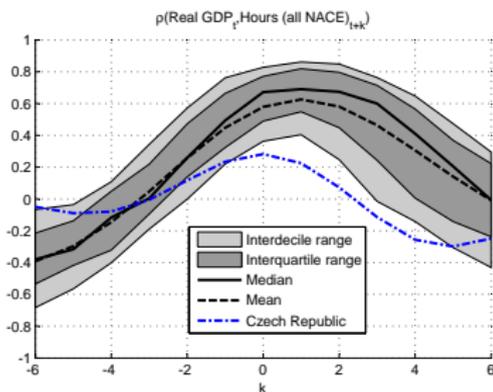
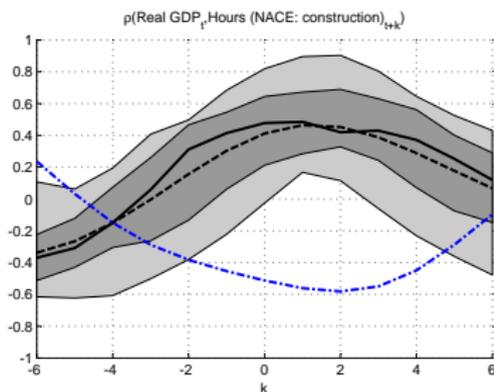
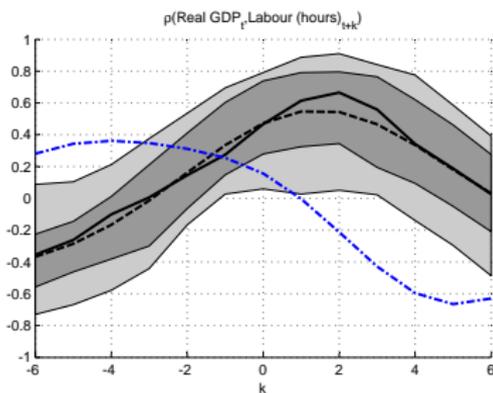
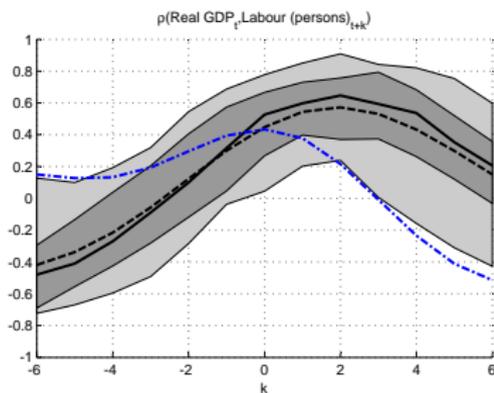
Cyclicality of house prices (band-pass filter)



Cyclicality of output of the construction sector (band-pass filter)



Cyclicity of labour input to the construction sector (band-pass filter)



Sensitivity analysis

We did sensitivity analysis:

1. filtration method (HP filter, growth rates)
2. other methods (DFM)
3. and more ... (ongoing research)

Property prices and output of / inputs to the construction sector **are** cyclical:

- ▶ true for the Czech Republic after 2005

We then ask what ingredients are needed to replicate these findings in a structural DSGE model

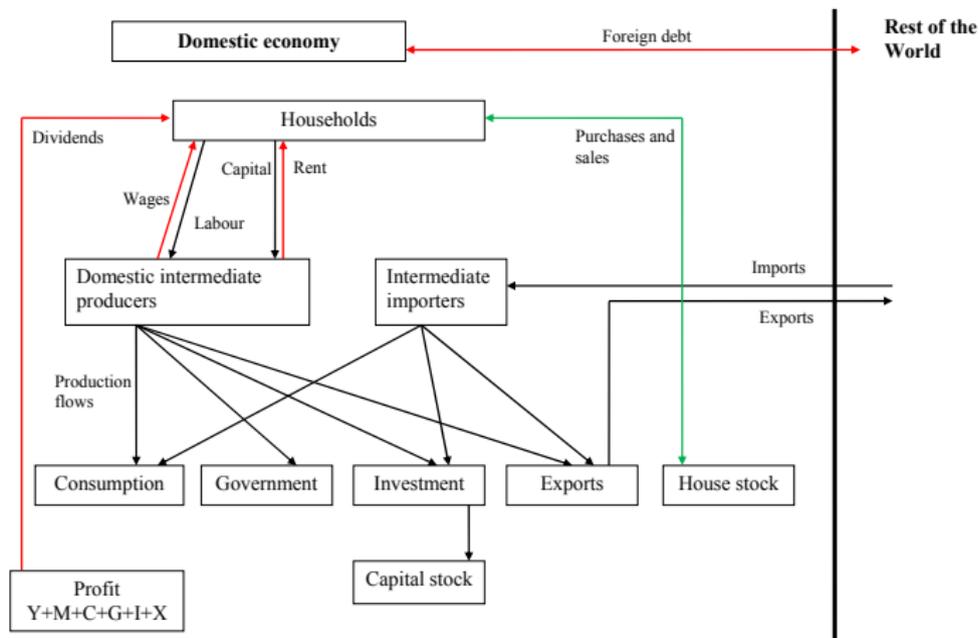
Cascade of DSGE models

We present four DSGE models with the housing sector of increasing complexity:

1. Houses are exogenous (falling from the sky): **fS**.
2. Houses are produced from the intermediate sector: **fY**.
3. Houses are produced with sector-specific inputs (labour, capital): **fLK**.
4. Houses are produced with sector-specific inputs and land: **fLKP**.

Moreover, we consider various values of the elasticity of substitution between consumption and housing.

Model: houses fall from the sky.



Black lines – real flows, red lines – financial flows, green lines – housing sector

Model: houses fall from the sky.

Utility function:

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \left(\prod_{\tau=0}^t \beta_{\tau} \right) \left[\frac{\log(C_t - \chi \bar{C}_{t-1}^F)}{(1 - \chi)^{-1}} + \frac{\phi_H \exp(\varepsilon_t^H) H_t^{1-\eta}}{1 - \eta} + \phi_L a_t^L (1 - L_t) \right],$$

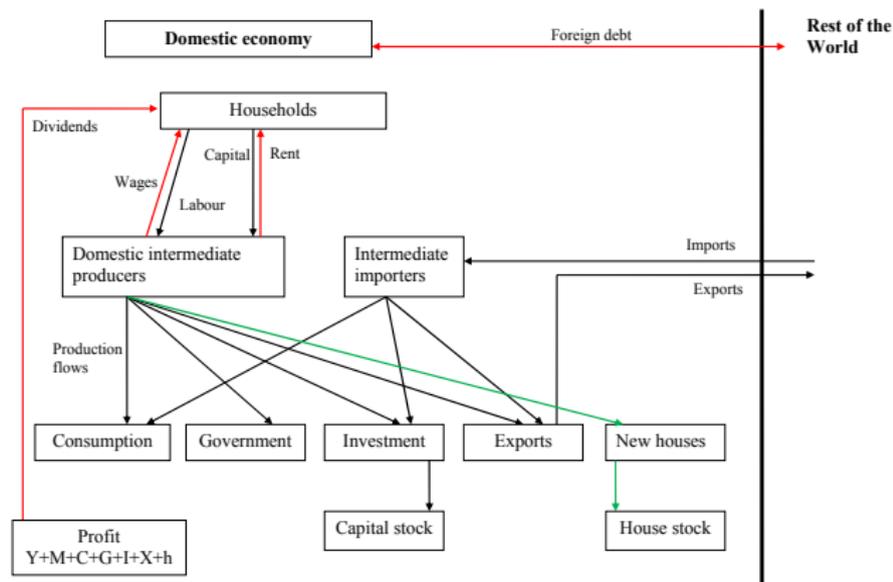
where C_t is consumption, \bar{C}^F is external habit, L_t is labour, H_t is the stock of houses, ε_t^H is a housing preference shock, η is the utility curvature with respect to the stock of houses.

The process for the amount of houses is an exogenous AR(1) defined as follows:

$$\log H_t = \rho_H \log H_{t-1} + (1 - \rho_H) \log H + \varepsilon_t^{\mathcal{H}},$$

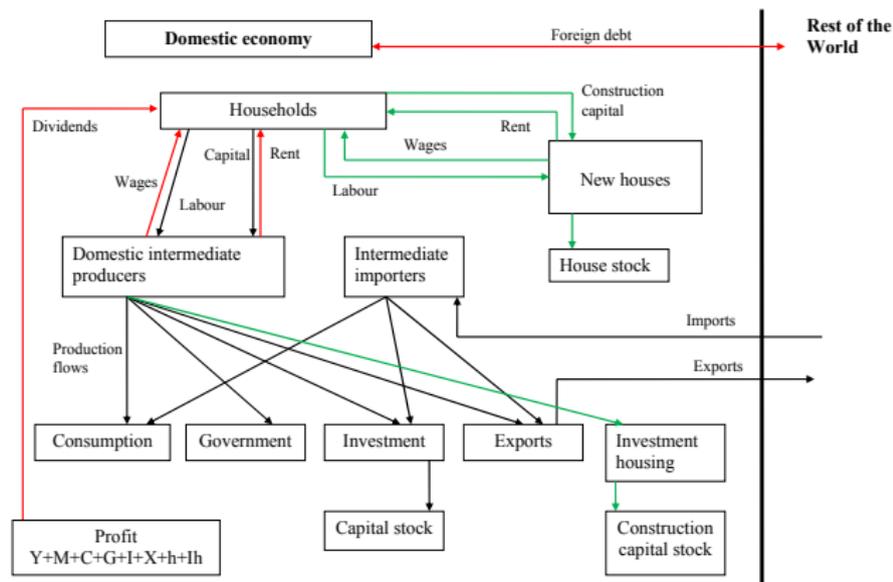
where ρ_H is an autoregressive parameter and $\varepsilon_t^{\mathcal{H}}$ is the exogenous shock.

Model: houses are produced from the intermediate good.



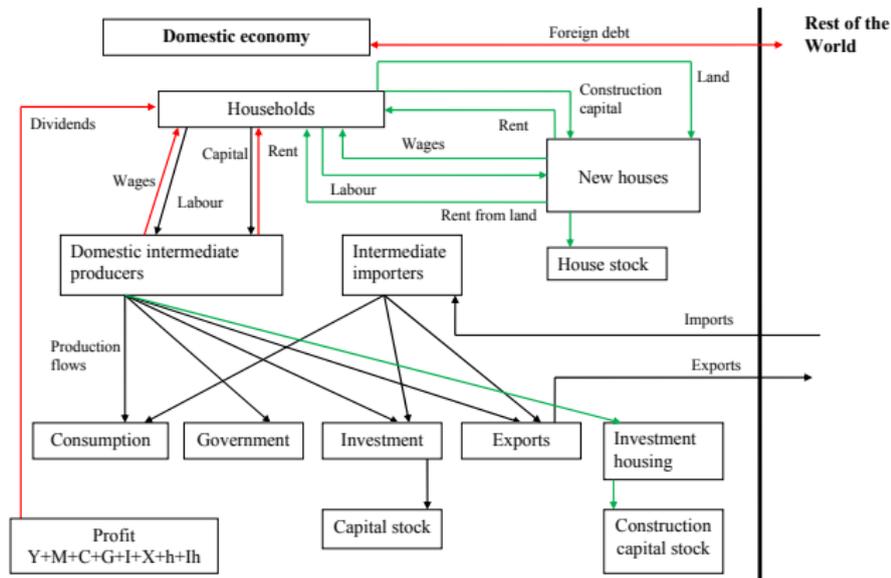
Black lines – real flows, red lines – financial flows, green lines – housing sector

Model: houses are produced from sector-specific inputs.



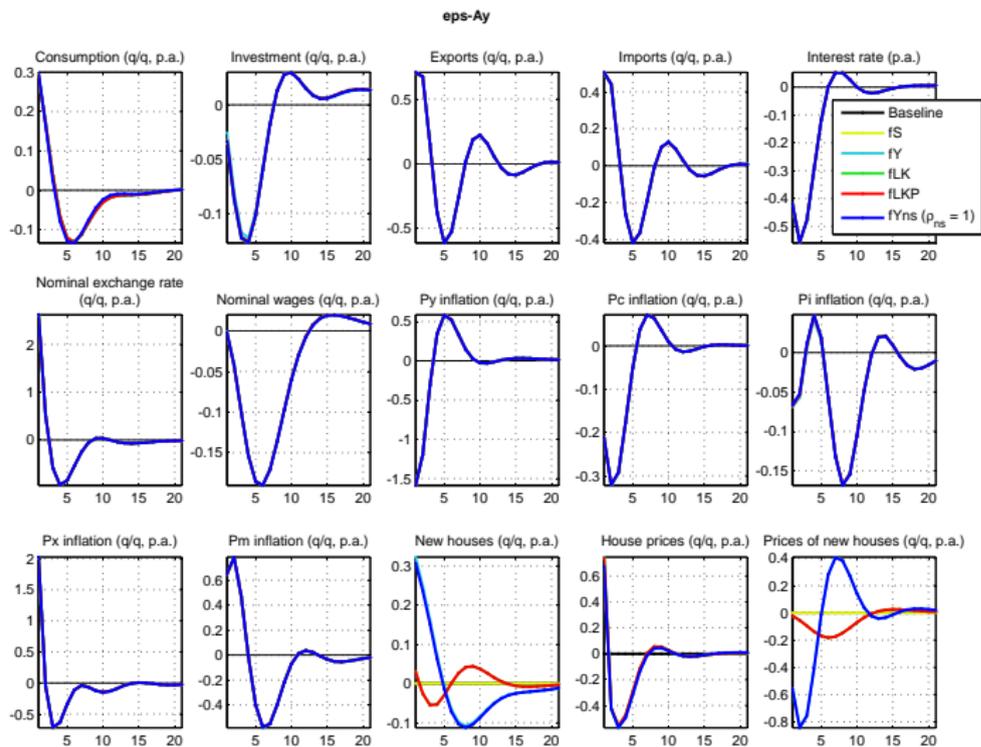
Black lines – real flows, red lines – financial flows, green lines – housing sector

Model: houses are produced also from land.

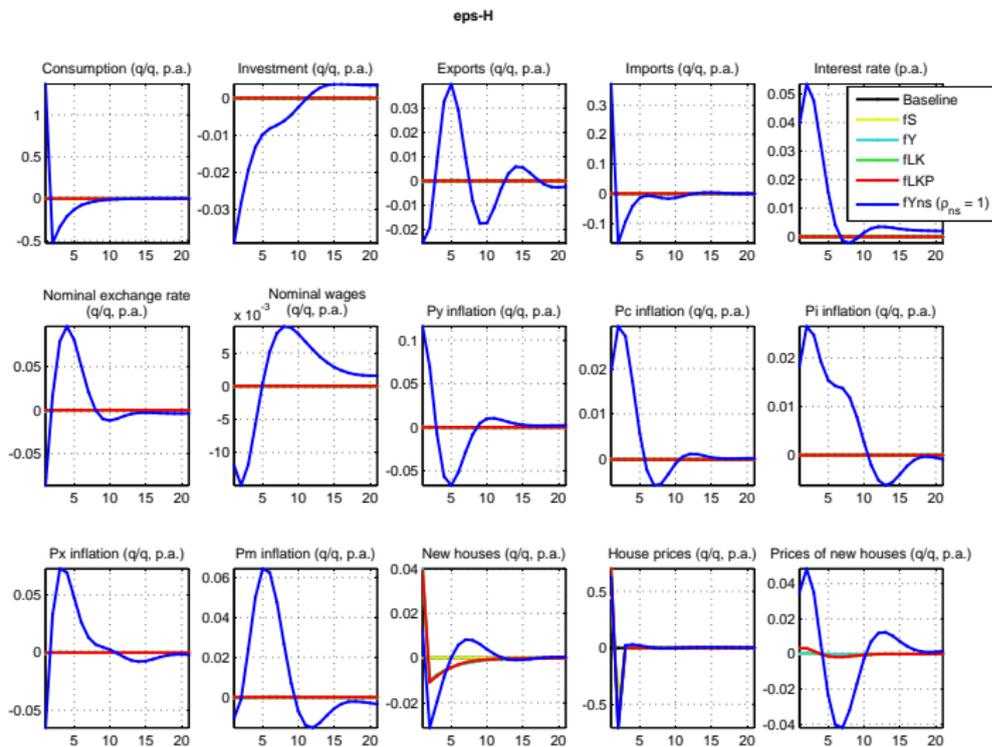


Black lines – real flows, red lines – financial flows, green lines – housing sector

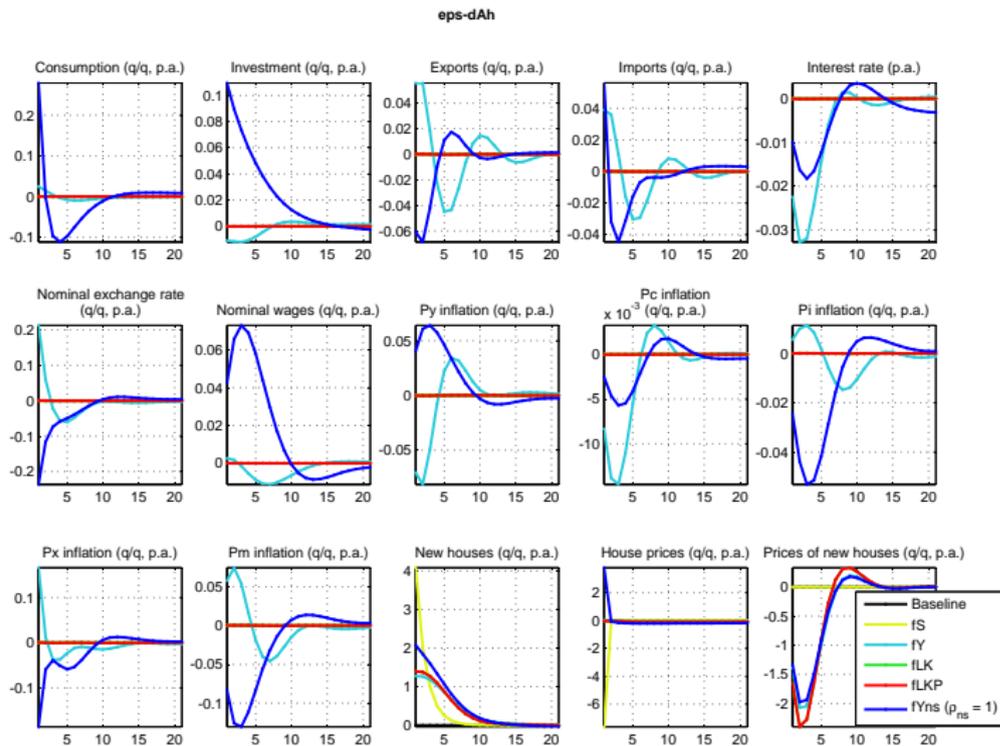
Impulse responses: technology shock



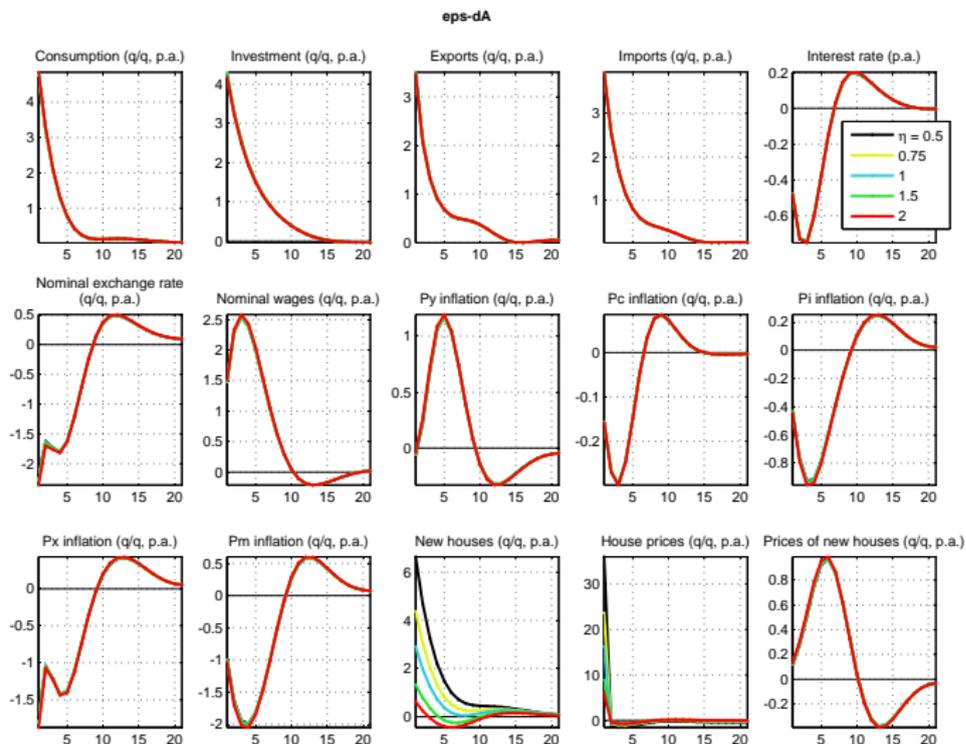
Impulse responses: housing preference shock



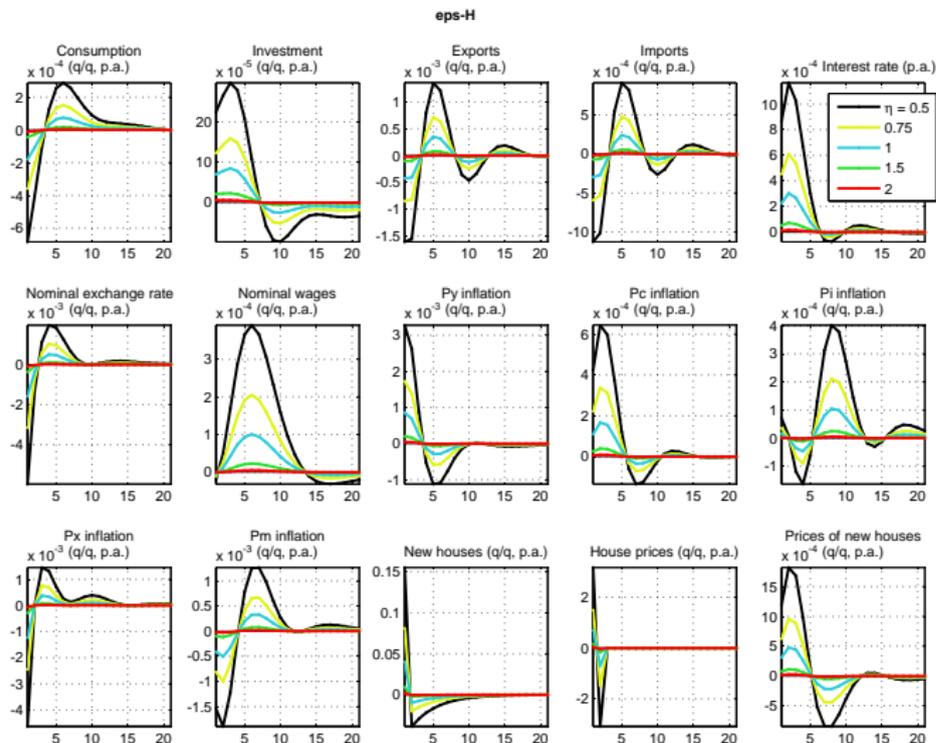
Impulse responses: shock to house technology



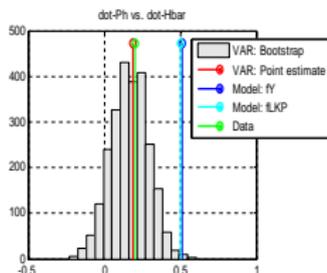
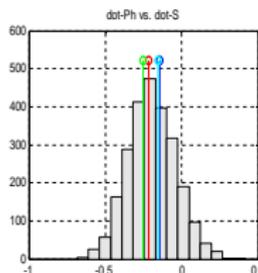
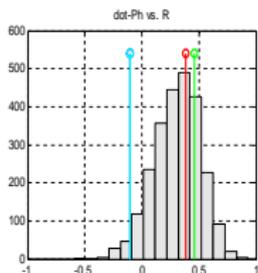
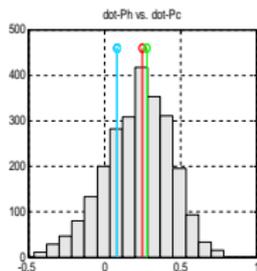
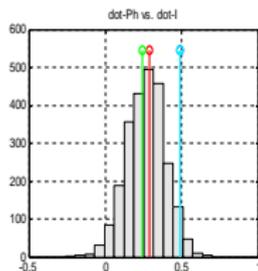
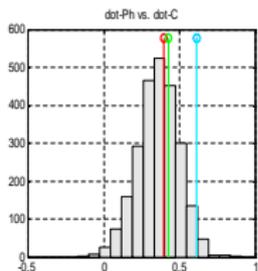
Impulse responses: technology shock under different parameterization of η (Model fY)



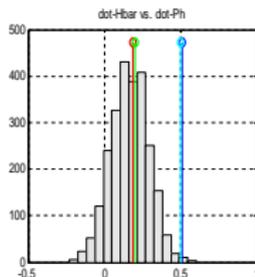
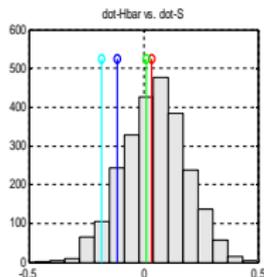
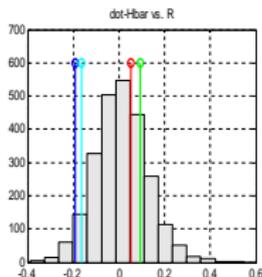
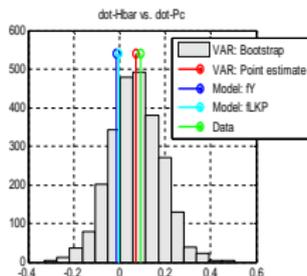
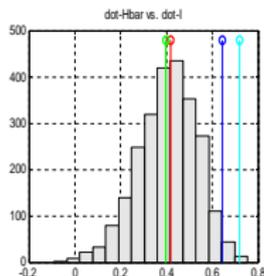
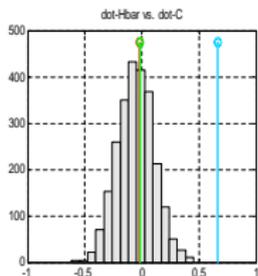
Impulse responses: housing preference shock under different parameterization of η (Model fY)



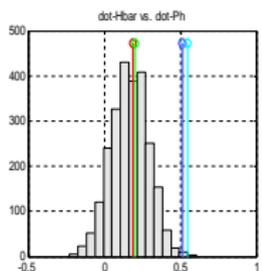
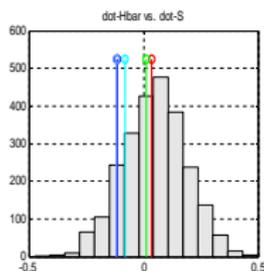
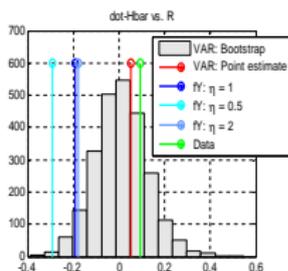
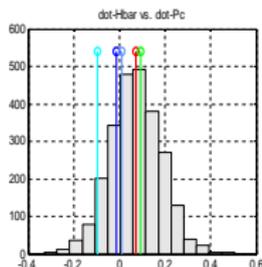
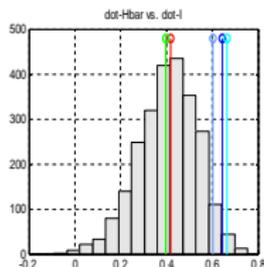
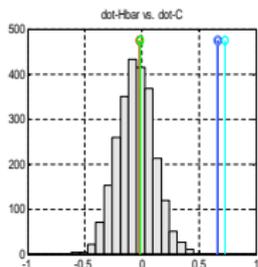
Moments: Correlation of House Prices with Selected Variables



Moments: Correlation of New Houses with Selected Variables



Moments: Correlation of New Houses with Selected Variables (Various Values of η)



Summary

In this research, we asked whether DSGE models without exotic features can replicate basic cyclical facts about the housing market:

- ▶ we believe that the answer is YES.
- ▶ Hence, no need to bother with the collateral effects etc. that:
 - ▶ are probably empirical not relevant (at least for European countries),
 - ▶ have counter-factual macroeconomic implications (counter-cyclicality of investments).
- ▶ Our research supports the view that house price fluctuations are merely symptoms of business cycles, not their cause.
 - ▶ although it may be that in *some* episodes, the cycle was amplified through the housing market (e.g. via balance sheets of financial institutions).

Thank you for your attention!

Comments and discussion welcome

Back-up slides

Related Micro Studies

Collateral channel – rejected:

Campbell and Cocco (2007) find on UK data a link between the financial market and house prices but not through the collateral effect of house prices on consumption.

Attanasio et al. (2009) identify expectations as the likely cause as the estimated effect is roughly the same for homeowners and renters.

McCarthy and McQuinn (2013) find on Irish data significant responses of consumption to house price shocks, but not through credit constraint.

Collateral channel – accepted:

Cooper (2013) reports a significant collateral channel without controlling for home ownership