Labor Market Participation, Unemployment and Monetary Policy

Alessia Campolmi[1] Stefano Gnocchi[2]

[1]Central European University and Magyar Nemzeti Bank

[2]Universitat Autonoma de Barcelona and MOVE

Search Frictions and Aggregate Dynamics
Bank of Finland, CEPR and Philadelphia Fed
Helsinki, 18-19 October 2012

New-Keynesian Perspectives on Business Cycles and Labor Markets

Large literature exploring the implications of two main frictions for macroeconomic fluctuations

- Nominal price rigidities: inflation, monetary policy and the business cycle.

  Calvo (1983), Yun (1996), King and Wolman (1996), Walsh (2003), Woodford (2003), Gali (2008)

- Labor market matching frictions: unemployment fluctuations and the business cycle.

  Diamond (1982), Mortensen (1982), Pissarides (1984), Merz (1995), Andolfatto (1996).

New-Keynesian Perspectives on Business Cycles and Labor Markets

Interaction between nominal rigidities and labor market frictions called into question to explain

- Phillips and Beveridge Curves: Cheron and Lanogot (2000)
- Persistence of monetary policy shocks: Walsh (2005), Trigari (2009)
- Inflation dynamics: Christoffel and Linzert (2005)
- The role of real wage rigidities: Gertler and Trigari (2009), Krause and Lubik (2007), Sveen and Weinke (2008).
- Optimal Monetary Policy: Thomas (2008), Faia (2009)

New class of models emerging: The NK-DMP paradigm

The Missing Margin

- NK-DMP imports from the DMP strand the assumption of inelastic labor force;

This implies that

- Households cannot substitute unemployment with voluntary non-employment.

The Missing Margin

Yet, PARTICIPATION MOVES

Table: Percentage standard deviations of selected unconditional moments (relative to output) - U.S. data: 1964-2007, HP-filtered

Unconditional Moments	Data
Unemployment rate volatility	7.40
Employment volatility	0.63
Participation rate volatility	0.20
Correlation of Participation with Output	0.42

- Barnichon and Figura, 2010: labor supply components account for 1/4 of unemployment's variance at business cycle frequency;
- Elsby, Hobijn and Sahin (2012): transitions between unemployment and non-participation account for 1/3 of cyclical variation in unemployment rate.

Our Contribution

- We consider the baseline NK-DMP model;
- We introduce the participation choice by making costly the entry to the labor market, modelling home production activity and search activity as both requiring time;
- We calibrate the model to US data;
- Monetary Policy and Second Moments: We study the impact of switching from flexible to strict inflation targeting in a model with endogenous participation and contrast it with the same switch in a model with constant (exogenous) participation and show that neglecting the participation margin can lead to incorrect conclusions (see next slide).

Results Preview

Moving from Flexible to Strict Inflation Targeting:

- Exogenous Participation ⇒ increases volatility of unemployment rate, employment and employment rate;
- Endogenous Participation ⇒ reduces the volatility of unemployment rate, employment and employment rate while increasing the volatility of participation.

Model Setup

- HOUSEHOLDS
  - Infinitely many members consuming a composite consumption good and home production; perfect insurance
  - Each member can be **employed**, **unemployed** or **non-participant**
  - Unemployed and Non-participants **home produce**
- FIRMS
  - **Intermediate goods producers:** perfect competition and matching frictions
  - **Final goods producers:** monopolistic competition and price rigidity

▸ Intermediate goods sector

▸ Final goods sector

- MONETARY POLICY: Central bank sets the nominal rate responding to inflation

▸ Monetary Policy

Household's decision problem

- Households choose C_t, D_t and N_t so as to maximize:

$$E_0 \sum_{t=0}^{\infty} \beta^t \left[Z_t \log(C_t) + \phi \frac{h_t{}^{1+\nu}}{1+\nu} \right] \tag{1}$$

- subject to:

$$P_t C_t + R_t^{-1} D_t \leq D_{t-1} + W_t E_t + P_t b U_t + T_t \tag{2}$$

$$h_t = [\xi_t (1 - E_t - \Gamma U_t)]^{1-\alpha_h} \tag{3}$$

$$E_t = (1-\rho) E_{t-1} + f_t (N_t - (1-\rho) E_{t-1}) \tag{4}$$

$$N_t = E_t + U_t \tag{5}$$

▸ HH F.O.C.

Some Conventional Parameters

Table 2: Parameter Values		
Parameter	Mnemonic	Value
Discoun Factor	β	0.99
Inter. elast. of subst. participation	ν	-5
Elast. Substitution	ϵ	6
Workers Bargaining Power	$1-\eta$	0.6
Calvo Parameter	ξ	2/3
Separation Rate	ρ	0.12
Matching Elasticity	γ	0.6
Returns to Employment	$1-\alpha$	2/3
Returns to Home production	$1-\alpha_h$	2/3
Inflation Reaction Coefficient	ϕ_π	1.5

Targets

Table 3: Steady State Moments	
Targets	Value U.S. Data
Employment Rate	0.94
Participation Rate	0.64
Job Filling Rate (q)	2/3
Replacement Rate (b/w)	0.4
Vacancy Cost as fraction of wages ($\kappa/(w*q)$)	0.045

Table 4: Implied Parameters		
Parameter	Mnemonic	Value
Matching Efficiency	ω	0.66
Vacancy Cost	κ	0.0196
Search Cost	Γ	0.44
Preference Shifter	Φ	0.04
Unemployment Benefit	b	0.2617

ATUS

Table: Time allocated to home production (minutes per day). Data are from the American Time Use Survey (ATUS) and were collected over the period 2003-2009.

Status	2003-2009	2003-2006
Employed	119	118
Unemployed	154	154
Not in labor force	178	183
Search cost Γ	0.41	0.44

- 98000 approx. individuals over 2003-2009
- selected from final round of CPS interviews
- time use and labor market status are observed

▸ IRMTFP ▸ IRPref ▸ IRHTFP

Table: Matching unconditional moments. Both models have been calibrated so as to give the best possible fit for the first 4 moments.

Unconditional Moments	Data	Endogenous	Exogenous
Output volatility	1.53	1.43	1.56
Unemployment rate volatility	7.40	7.36	7.55
Employment volatility	0.63	0.67	0.47
Corr. Unempl. rate with Output	-0.85	-0.75	-1
Participation rate volatility	0.20	0.24	-
Corr. of Part. with Output	0.42	0.56	-

Calibrated Parameters		
st.dev. market TFP	0.0070	0.0074
st.dev. home TFP	0.0037	0.0070
st.dev. preference shock	0.0147	0
$corr_{A,AH}$	0.9474	1

The Participation Condition

- Frictions introduce a wedge between home production and employment decision $(\frac{1-f_t}{f_t})$
- Increasing f_t increases participation, given $C_t \Rightarrow$ substitute home production with consumption
- Increasing C_t reduces participation, given $f_t \Rightarrow$ wealth effect

Forces driving participation choice

- Finding rates
- Marginal rate of substitution (MRS) between consumption and home production

The smaller the search cost Γ, the stronger the role of finding rates!

Why? $\Rightarrow$

The Role of Search Costs

$$h_t = 1 - E_t - \Gamma U_t \tag{6}$$

- $\Gamma = 1 \Rightarrow h_t = 1 - N_t$, participation responds to match desired home production only $\rightarrow$ movements in finding rates do not affect home production
- $\Gamma = 0 \Rightarrow h_t = 1 - E_t$, participation responds **also** to finding rates

$$E_t = (1 - \rho)(1 - f_t)E_{t-1} + f_t N_t \tag{7}$$

- In our calibration both finding rates and MRS are relevant.

Participation and Monetary Policy

- How do second moments change if monetary policy switches from flexible ($\phi = 1.5$) to strict ($\phi = 100$) inflation targeting?
- How does the presence of the participation margin affect the answer?
- What if the search cost is high?

Endogenous vs Exogenous

For each model we use the best possible calibration. However, since the two models differ only in the volatility of the shocks, *conditionally on each shock* differences in the predicted moments across models are entirely due to the presence (or lack) of the participation margin!

Table: Percentage standard deviations of output and of selected moments (relative to output) in the endogenous and exogenous participation models, conditionally on market technology shocks. The table reports the value of moments under strict inflation targeting. In parenthesis it is reported the value for an inflation coefficient equal to 1.5 in the Taylor rule.

Moments Cond. on MTFP Shocks	Endogenous	Exogenous
Output volatility	1.24 (1.12)	1.17 (1.08)
Unempl. rate volatility	8.33 (5.40)	2.07 (0.12)
Empl. volatility	0.20 (0.07)	0.13 (0.008)
Empl. rate volatility	0.52 (0.34)	0.13 (0.008)
Part. rate volatility	0.32 (0.27)	0 (0)
Corr. of Part. with Output	-0.99 (-0.99)	0 (0)
Corr. of Unempl. rate with Output	-1 (-1)	-1 (-1)

Endogenous Vs Exogenous: TFP Shocks

- Strict inflation targeting replicates flexible price equilibrium ⇒ by eliminating inefficient fluctuations in price mark-ups it boosts the sensitivity of aggregate demand to MTFP ⇒ increases volatility in both models;

- With constant participation the stronger response of finding rate pushes home production below stst (but desired level is constant!) ⇒ Household decreases participation to partially undo the rise in finding rates ⇒ endogenous participation dampens reaction of employment, employment rate and unemployment rate to changes in MP

Monetary Policy: Conditional Moments

- MTFP shock ⇒ strict inflation targeting increases volatility of the variables in both models but the model with exogenous participation over-predicts such increase;
- HTFP shock ⇒ a change in monetary policy has no consequences in a model with exogenous participation. With endogenous participation instead the volatility of both unemployment and employment rates is reduced. Participation becomes less volatile;

▸ Home Tech. Shock

- Preference shock ⇒ Same as HTFP shock with the only difference that now participation becomes more volatile.

▸ Pref. Shock

Monetary Policy: Unconditional Moments

- Exogenous Participation ⇒ strict inflation targeting increases volatility of unemployment rate, employment and employment rate;
- Endogenous Participation ⇒ strict inflation targeting reduces the volatility of unemployment rate, employment and employment rate while increasing the volatility of participation.

▸ Unconditional Moments

Conclusions

- Participation moves over the cycle;
- Participation responds to frictions and changes in monetary policy affect the relevance of frictions;
- Models overlooking participation may deliver wrong policy implications;
- The strength of the channel depends on the search costs.

▸ Search Cost

Household's first order conditions

We define the utility loss needed to marginally increase employment as

$$\Omega_t \equiv \frac{(1-f_t)}{f_t}\left[\frac{\phi\Gamma h_t^{\nu} C_t}{Z_t}\xi_t(1-\alpha_h)h_t^{-\frac{\alpha_h}{1-\alpha_h}} - b\right] \tag{8}$$

- Participation condition

$$\Omega_t = \frac{W_t}{P_t} - \frac{\phi h_t^{\nu} C_t}{Z_t}\xi_t(1-\alpha_h)h_t^{-\frac{\alpha_h}{1-\alpha_h}} + E_t\left\{\frac{\beta C_t(1-\rho)}{C_{t+1}}\frac{Z_{t+1}}{Z_t}\Omega_{t+1}\right\}$$

- Euler equation

$$\beta R_t E_t\left\{\frac{C_t}{C_{t+1}}\frac{Z_{t+1}}{Z_t}\frac{P_t}{P_{t+1}}\right\} = 1 \tag{9}$$

Back

Matching frictions

- Production function of producer j when matched with a worker

$$X_t(j) = A_t \tag{10}$$

- To find a worker j needs to open a vacancy and search paying κ final goods
- Labor market tightness: $\theta_t \equiv \frac{V_t}{S_t}$
- Job filling rate: $q_t \equiv \omega \theta_t^{-\gamma}$,
- Job finding rate: $f_t \equiv \theta_t q_t$.
- Free entry condition in the market of intermediate producers determine vacancy posting

$$\frac{\kappa}{q_t} = \frac{P_t^x}{P_t} A_t - \frac{W_t}{P_t} + (1-\rho) E_t \left\{ Q_{t,t+1} \frac{\kappa}{q_{t+1}} \right\} \tag{11}$$

Back

Wage Bargaining

- Value of employment

$$V_t^w = \frac{W_t}{P_t} - b - \frac{\phi h_t^{\nu}(1-\Gamma)C_t}{Z_t}\xi_t(1-\alpha_h)h_t^{-\frac{\alpha_h}{1-\alpha_h}} + E_t\left\{Q_{t,t+1}(1-\rho)(1-f_{t+1})V_{t+1}^w\right\} \quad (12)$$

- Nash Bargaining (η: firm's bargaining power)

$$\eta V_t^w = (1-\eta)V_t^J \quad (13)$$

- Wage equation

$$\frac{W_t}{P_t} = (1-\eta)\frac{P_t^x}{P_t}A_t + \eta\left[b + \frac{\phi h_t^{\nu}(1-\Gamma)C_t}{Z_t}\xi_t(1-\alpha_h)h_t^{-\frac{\alpha_h}{1-\alpha_h}}\right] + (1-\eta)(1-\rho)E_t\left\{Q_{t,t+1}\kappa\theta_{t+1}\right\} \quad (14)$$

Back

Sticky prices

- Production function

$$Y_t(i) = X_t(i)^{1-\alpha} \tag{15}$$

- Demand

$$Y_t(i) = \left[\frac{P_t(i)}{P_t}\right]^{-\varepsilon} [C_t + \kappa V_t] \tag{16}$$

- Phillips Curve

$$\widehat{\pi}_t = \beta E_t \left\{\widehat{\pi}_{t+1}\right\} + \lambda \left[\frac{\widehat{P_t^x}}{P_t} + \alpha \widehat{x}_t\right] \tag{17}$$

$$\lambda = \frac{(1-\xi)(1-\beta\xi)}{\xi} \frac{1-\alpha}{1-\alpha+\alpha\varepsilon}$$

Back

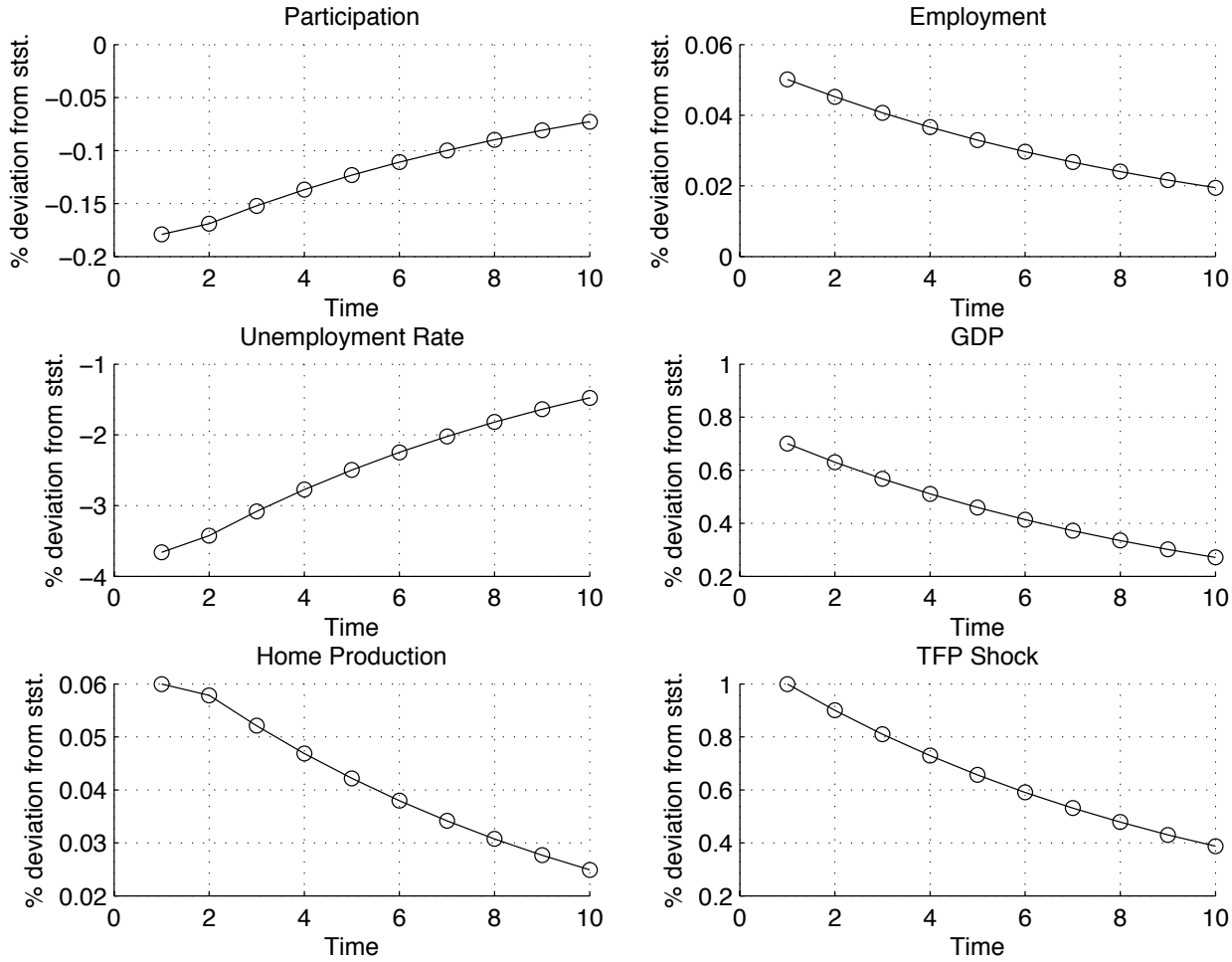
Monetary Policy

- Simple Taylor rule

$$\log(R_t) = -\log(\beta) + \phi_\pi \widehat{\pi}_t \tag{18}$$

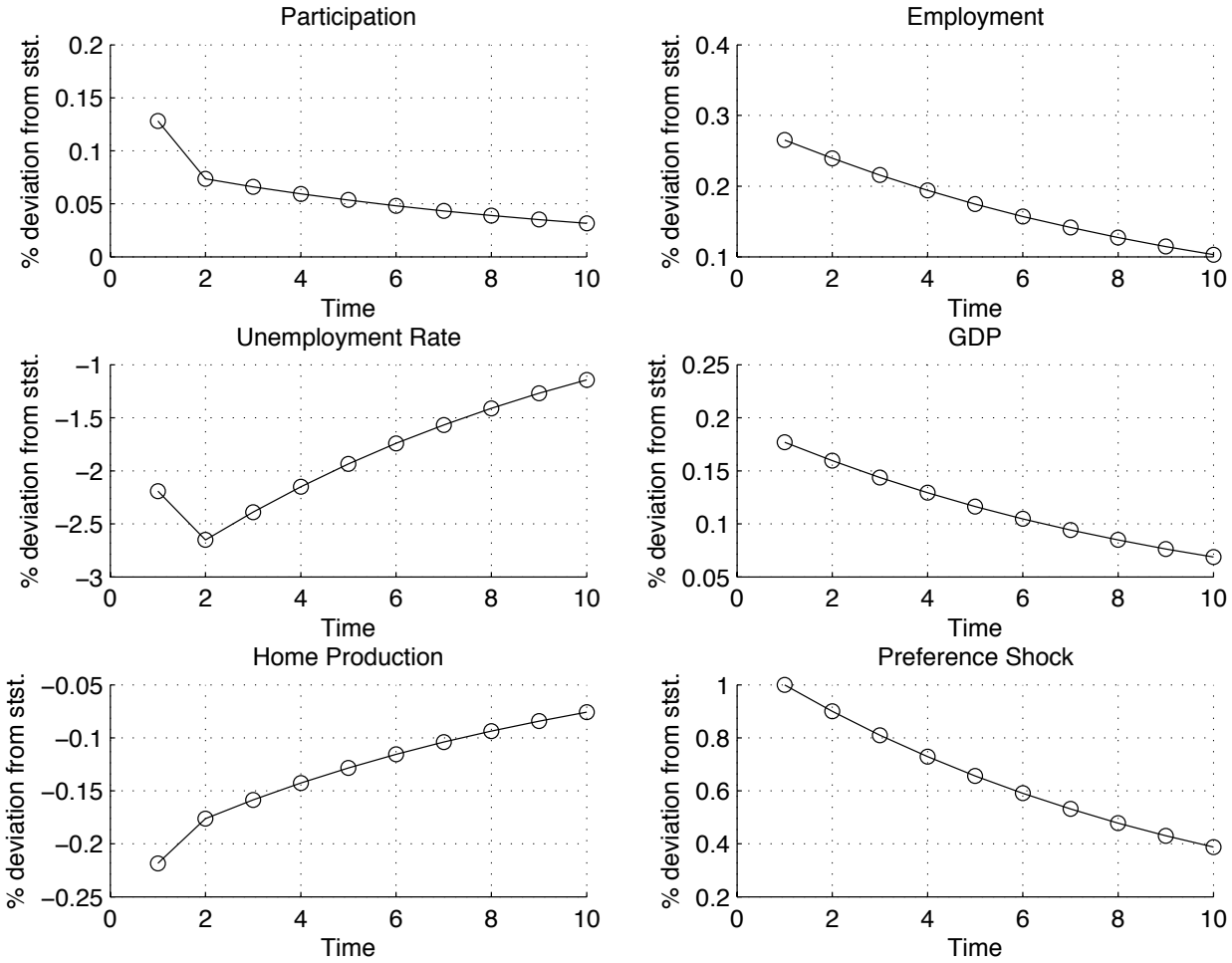
Back

Figure: Impulse Responses to a market production TFP shock



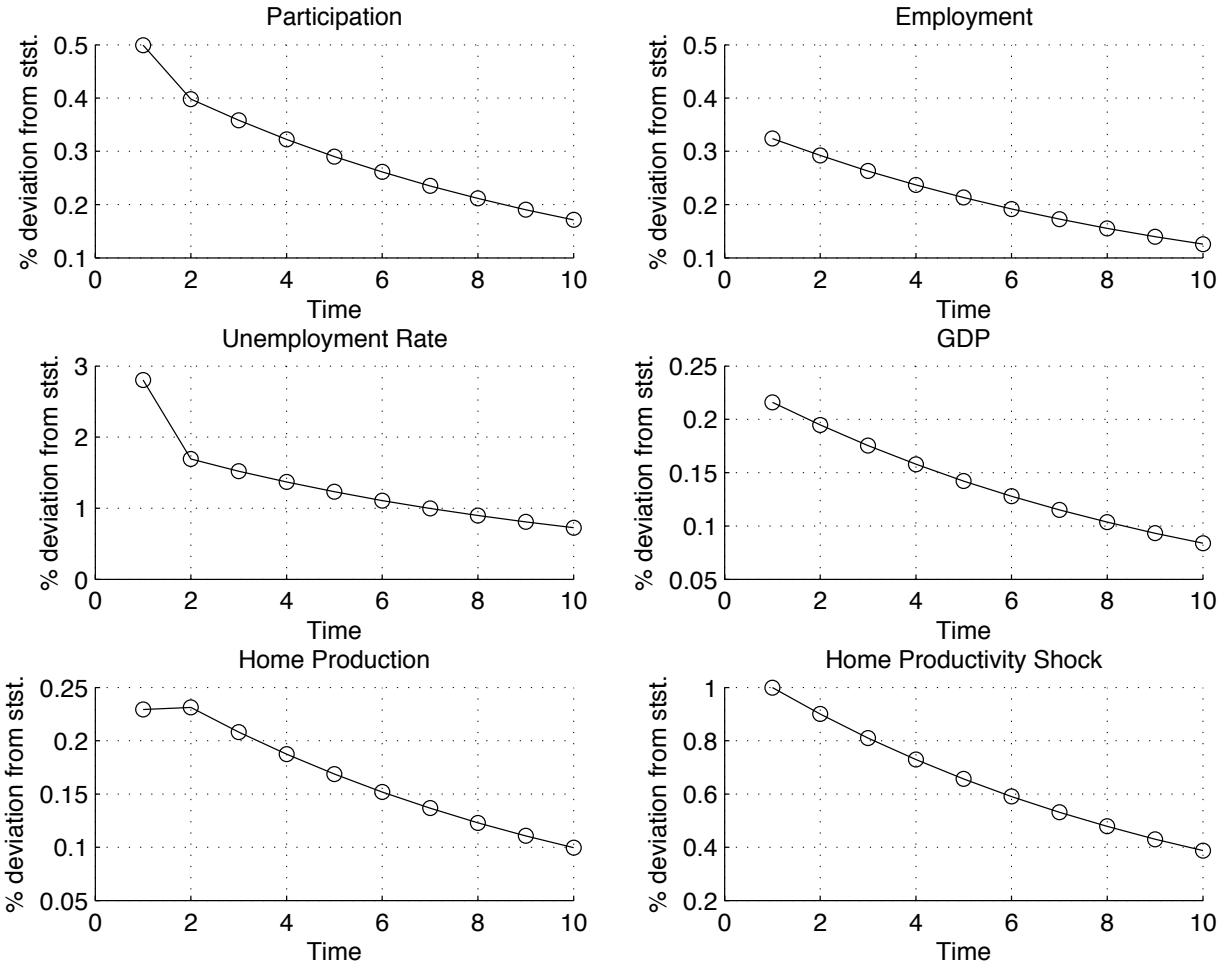
Back

Figure: Impulse Responses to a preference shock



Back

Figure: Impulse Responses to a home productivity shock



Back

Table: Percentage standard deviations of output and of selected moments (relative to output) in the endogenous and exogenous participation models, conditionally on preference shocks. The table reports the value of moments under strict inflation targeting. In parenthesis it is reported the value for an inflation coefficient equal to 1.5 in the Taylor rule.

Moments Cond. on Preference Shocks	Endogenous	Exogenous
Output volatility	0.29 (0.60)	0 (0)
Unempl. rate volatility	7.56 (15.91)	23.97 (23.97)
Empl. volatility	1.5 (1.5)	1.5 (1.5)
Empl. rate volatility	0.47 (1.00)	1.5 (1.5)
Part. rate volatility	1.92 (0.52)	0 (0)
Corr. of Part. with Output	0.99 (0.98)	0 (0)
Corr. of Unempl. rate with Output	0.85 (-0.99)	-1 (-1)

Back

Table: Percentage standard deviations of output and of selected moments (relative to output) in the endogenous and exogenous participation models, conditionally on home technology shocks. The table reports the value of moments under strict inflation targeting. In parenthesis it is reported the value for an inflation coefficient equal to 1.5 in the Taylor rule.

Moments Cond. on HTFP Shocks	Endogenous	Exogenous
Output volatility	0.20 (0.18)	0.52 (0.49)
Unempl. rate volatility	7.21 (9.63)	23.97 (23.97)
Empl. volatility	1.5 (1.5)	1.5 (1.5)
Empl. rate volatility	0.45 (0.60)	1.5 (1.5)
Part. rate volatility	1.89 (2.10)	0 (0)
Corr. of Part. with Output	0.99 (1)	0 (0)
Corr. of Unempl. rate with Output	0.84 (0.98)	-1 (-1)

Back

Table: Percentage standard deviations of output and of selected unconditional moments (relative to output) in the endogenous and exogenous participation models. The table reports the value of moments under strict inflation targeting. In parenthesis it is reported the value for an inflation coefficient equal to 1.5 in the Taylor rule.

Unconditional Moments	Endogenous	Exogenous
Output volatility	1.46 (1.43)	1.69 (1.56)
Unempl. rate volatility	6.52 (7.35)	8.79 (7.57)
Empl. volatility	0.48 (0.67)	0.55 (0.47)
Empl. rate volatility	0.41 (0.46)	0.55 (0.47)
Part. rate volatility	0.40 (0.24)	0 (0)
Corr. of Part. with Output	0.13 (0.56)	0 (0)
Corr. of Unempl. rate with Output	-0.90 (-0.76)	-1 (-1)

Back

Monetary Policy: MTFP Shock - High Search Cost

◂ Conclusions

Table: Selected moments in the endogenous and exogenous participation models, conditionally on MTFP shocks. Volatilities are expressed in percentage standard deviations. Here we depart from the baseline calibration and assume a high households' search cost i.e., 0.99. The table reports the value of moments under strict inflation targeting. In parenthesis are the values for an inflation coefficient equal to 1.5 in the Taylor rule.

Volatility	Endogenous	Exogenous
Empl. rate	0.1100 (0.0699)	0.1107 (0.0726)
Unempl. rate	1.7682 (1.1606)	1.7580 (1.0689)
Part. rate	0.0048 (0.0583)	0 (0)