Procyclical Productivity in New Keynesian Models

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Impulse and Propagation Mechanisms

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- Our theory shows analytically how this mechanism works and improves a lot the performance of a version of medium-scale DSGE (Christiano et al., 2016).
- We view it as a step forward in aligning the model with data.

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- Since search effort is not measured as an input, higher occupancy rate looks like higher productivity.
- Unlike costly capital/labor utilization models, firms do not pay for this higher productivity.

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- Matching probabilities per unit of search effort and per firm are $\psi^h(q) \equiv \frac{\psi(J(p,q),D(p,q))}{D(p,q)}$ and

$$\psi^f(q) \equiv \frac{\psi(J(p,q), D(p,q))}{J(p,q)} \qquad \text{(occupancy rate is TFP).}$$

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- The household chooses $\mathcal{I}$, d, and $\{c_i\}$ to maximize utility.

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- These two objects are what firms take as given when solving their problem.

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- Firms take as given nominal wages W, functions $\widetilde{c}(e, \overline{v}, p)$ and $\widetilde{q}(e, \overline{v}, p)$, and a Rotemberg style price adjustment cost $\chi(p)\ e$ to maximize profits:

$$\Omega(e, W, \overline{v}) = \max_{p} \left(p\ \psi^f(\widetilde{q}(e, \overline{v}, p)) - W \right)\ \widetilde{c}(e, \overline{v}, p) - \chi(p)\ e,$$

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- The standard case has full occupancy $\psi^f(Q^*) = 1$ & $\mathcal{E}(Q^*) = 0$. The hhold condition disappears and the firm's optimality condition becomes

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- Perturbation of the equilibrium conditions yields

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  - $\widetilde{\gamma}$ captures the elasticity of gross desired markup $\rho\,(1 - \mathcal{E}(Q^*))$ w.r.t. occupancy rate $\psi^f(Q^*)$ (just an algebraic connection).

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Important Numbers from the Estimation Results

	Capital Util Alone (u)
Steady-state markup	**0.53**

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	Capital Util Alone (u)
Steady-state markup	**0.53**
Fixed cost of production / GDP	**0.39**

Important Numbers from the Estimation Results

	Capital Util Alone (u)
Steady-state markup	**0.53**
Fixed cost of production / GDP	**0.39**
Frisch elasticity of labor supply	**9.09**

Important Numbers from the Estimation Results

	Capital Util Alone (u)
Steady-state markup	**0.53**
Fixed cost of production / GDP	**0.39**
Frisch elasticity of labor supply	**9.09**
corr(Markup, GDP | FFR shocks)	**0.06**

Important Numbers from the Estimation Results

	Capital Util Alone (u)
Steady-state markup	**0.53**
Fixed cost of production / GDP	**0.39**
Frisch elasticity of labor supply	**9.09**
corr(Markup, GDP | FFR shocks)	**0.06**
Log marginal likelihood	**3.8**

Important Numbers from the Estimation Results

	Capital Util Alone (u)
Steady-state markup	**0.53**
Fixed cost of production / GDP	**0.39**
Frisch elasticity of labor supply	**9.09**
corr(Markup, GDP | FFR shocks)	**0.06**
Log marginal likelihood	**3.8**
Curvature of capital utilization cost	**0.10**
Elast. of TFP wrt real spending, $\widetilde{\Psi}$	-
Elast. of desired markup wrt TFP, $\widetilde{\gamma}$	-

Important Numbers from the Estimation Results

	Capital Util Alone (u)	Search Alone
Steady-state markup	**0.53**	**0.25**
Fixed cost of production / GDP	**0.39**	
Frisch elasticity of labor supply	**9.09**	
corr(Markup, GDP | FFR shocks)	**0.06**	
Log marginal likelihood	**3.8**	
Curvature of capital utilization cost	**0.10**	
Elast. of TFP wrt real spending, $\widetilde{\Psi}$	-	
Elast. of desired markup wrt TFP, $\widetilde{\gamma}$	-	

Important Numbers from the Estimation Results

	Capital Util Alone (u)	Search Alone
Steady-state markup	**0.53**	**0.25**
Fixed cost of production / GDP	**0.39**	**0.14**
Frisch elasticity of labor supply	**9.09**	
corr(Markup, GDP | FFR shocks)	**0.06**	
Log marginal likelihood	**3.8**	
Curvature of capital utilization cost	**0.10**	
Elast. of TFP wrt real spending, $\widetilde{\Psi}$	-	
Elast. of desired markup wrt TFP, $\widetilde{\gamma}$	-	

Important Numbers from the Estimation Results

	Capital Util Alone (u)	Search Alone
Steady-state markup	**0.53**	**0.25**
Fixed cost of production / GDP	**0.39**	**0.14**
Frisch elasticity of labor supply	**9.09**	**1.01**
corr(Markup, GDP | FFR shocks)	**0.06**	
Log marginal likelihood	**3.8**	
Curvature of capital utilization cost	**0.10**	
Elast. of TFP wrt real spending, $\widetilde{\Psi}$	-	
Elast. of desired markup wrt TFP, $\widetilde{\gamma}$	-	

Important Numbers from the Estimation Results

	Capital Util Alone (u)	Search Alone
Steady-state markup	**0.53**	**0.25**
Fixed cost of production / GDP	**0.39**	**0.14**
Frisch elasticity of labor supply	**9.09**	**1.01**
corr(Markup, GDP | FFR shocks)	**0.06**	**0.76**
Log marginal likelihood	**3.8**	
Curvature of capital utilization cost	**0.10**	
Elast. of TFP wrt real spending, $\widetilde{\Psi}$	-	
Elast. of desired markup wrt TFP, $\widetilde{\gamma}$	-	

Important Numbers from the Estimation Results

	Capital Util Alone (u)	Search Alone
Steady-state markup	**0.53**	**0.25**
Fixed cost of production / GDP	**0.39**	**0.14**
Frisch elasticity of labor supply	**9.09**	**1.01**
corr(Markup, GDP | FFR shocks)	**0.06**	**0.76**
Log marginal likelihood	**3.8**	**117.1**
Curvature of capital utilization cost	**0.10**	
Elast. of TFP wrt real spending, $\widetilde{\Psi}$	-	
Elast. of desired markup wrt TFP, $\widetilde{\gamma}$	-	

Important Numbers from the Estimation Results

	Capital Util Alone (u)	Search Alone
Steady-state markup	**0.53**	**0.25**
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Frisch elasticity of labor supply	**9.09**	**1.01**
corr(Markup, GDP | FFR shocks)	**0.06**	**0.76**
Log marginal likelihood	**3.8**	**117.1**
Curvature of capital utilization cost	**0.10**	∞
Elast. of TFP wrt real spending, $\widetilde{\Psi}$	-	**0.42**
Elast. of desired markup wrt TFP, $\widetilde{\gamma}$	-	**0.27**

Important Numbers from the Estimation Results

	Capital Util Alone (u)	Search Alone	Both u and Search
Steady-state markup	**0.53**	**0.25**	**0.14**
Fixed cost of production / GDP	**0.39**	**0.14**	
Frisch elasticity of labor supply	**9.09**	**1.01**	
corr(Markup, GDP | FFR shocks)	**0.06**	**0.76**	
Log marginal likelihood	**3.8**	**117.1**	
Curvature of capital utilization cost	**0.10**	∞	
Elast. of TFP wrt real spending, $\widetilde{\Psi}$	-	**0.42**	
Elast. of desired markup wrt TFP, $\widetilde{\gamma}$	-	**0.27**	

Important Numbers from the Estimation Results

	Capital Util Alone (u)	Search Alone	Both u and Search
Steady-state markup	**0.53**	**0.25**	**0.14**
Fixed cost of production / GDP	**0.39**	**0.14**	**0.03**
Frisch elasticity of labor supply	**9.09**	**1.01**	
corr(Markup, GDP | FFR shocks)	**0.06**	**0.76**	
Log marginal likelihood	**3.8**	**117.1**	
Curvature of capital utilization cost	**0.10**	∞	
Elast. of TFP wrt real spending, $\widetilde{\Psi}$	-	**0.42**	
Elast. of desired markup wrt TFP, $\widetilde{\gamma}$	-	**0.27**	

Important Numbers from the Estimation Results

	Capital Util Alone (u)	Search Alone	Both u and Search
Steady-state markup	**0.53**	**0.25**	**0.14**
Fixed cost of production / GDP	**0.39**	**0.14**	**0.03**
Frisch elasticity of labor supply	**9.09**	**1.01**	**1.56**
corr(Markup, GDP | FFR shocks)	**0.06**	**0.76**	
Log marginal likelihood	**3.8**	**117.1**	
Curvature of capital utilization cost	**0.10**	∞	
Elast. of TFP wrt real spending, $\widetilde{\Psi}$	-	**0.42**	
Elast. of desired markup wrt TFP, $\widetilde{\gamma}$	-	**0.27**	

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corr(Markup, GDP | FFR shocks)	**0.06**	**0.76**	**0.96**
Log marginal likelihood	**3.8**	**117.1**	
Curvature of capital utilization cost	**0.10**	∞	
Elast. of TFP wrt real spending, $\widetilde{\Psi}$	-	**0.42**	
Elast. of desired markup wrt TFP, $\widetilde{\gamma}$	-	**0.27**	

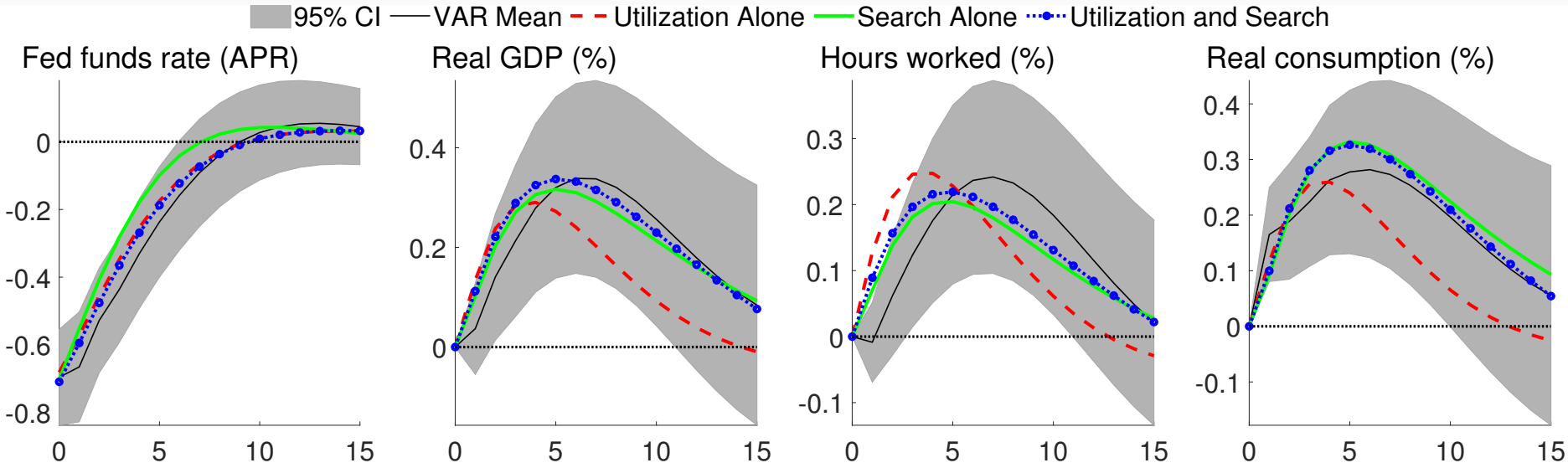
Important Numbers from the Estimation Results

	Capital Util Alone (u)	Search Alone	Both u and Search
Steady-state markup	**0.53**	**0.25**	**0.14**
Fixed cost of production / GDP	**0.39**	**0.14**	**0.03**
Frisch elasticity of labor supply	**9.09**	**1.01**	**1.56**
corr(Markup, GDP | FFR shocks)	**0.06**	**0.76**	**0.96**
Log marginal likelihood	**3.8**	**117.1**	**167.1**
Curvature of capital utilization cost	**0.10**	∞	
Elast. of TFP wrt real spending, $\widetilde{\Psi}$	-	**0.42**	
Elast. of desired markup wrt TFP, $\widetilde{\gamma}$	-	**0.27**	

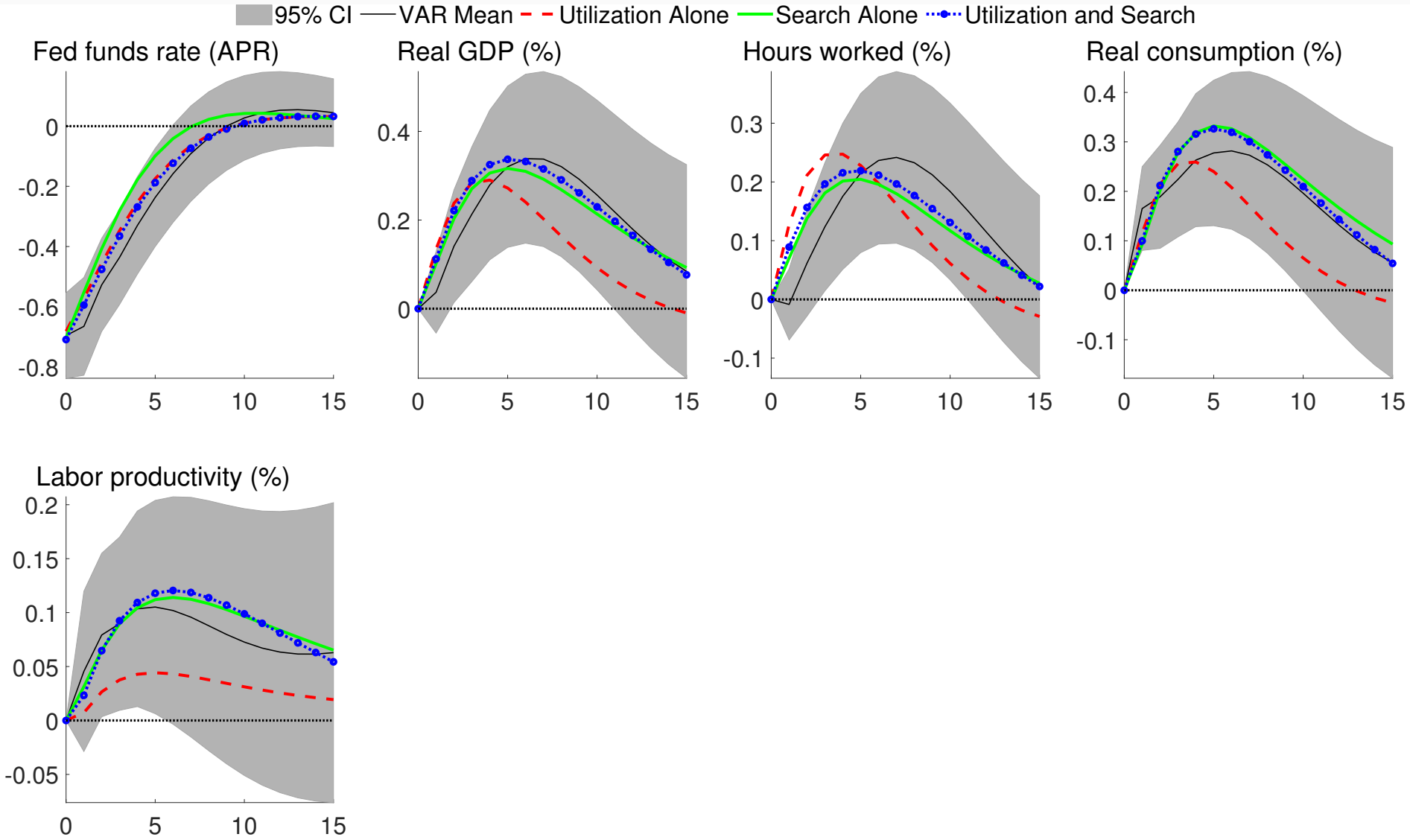
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Steady-state markup	**0.53**	**0.25**	**0.14**
Fixed cost of production / GDP	**0.39**	**0.14**	**0.03**
Frisch elasticity of labor supply	**9.09**	**1.01**	**1.56**
corr(Markup, GDP | FFR shocks)	**0.06**	**0.76**	**0.96**
Log marginal likelihood	**3.8**	**117.1**	**167.1**
Curvature of capital utilization cost	**0.10**	∞	**0.36**
Elast. of TFP wrt real spending, $\widetilde{\Psi}$	-	**0.42**	**0.39**
Elast. of desired markup wrt TFP, $\widetilde{\gamma}$	-	**0.27**	**0.79**

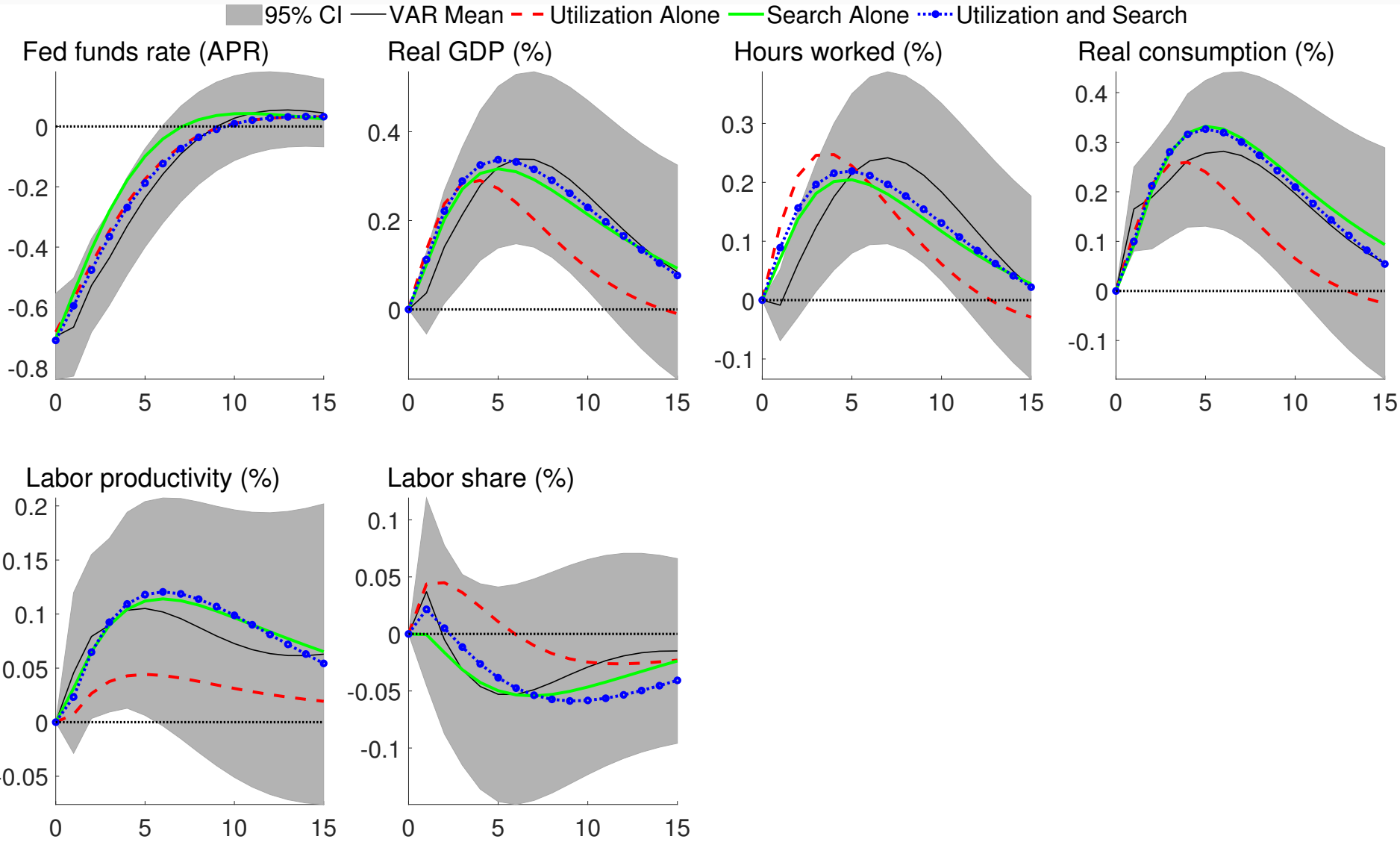
Selected Results of Impulse Response Matching



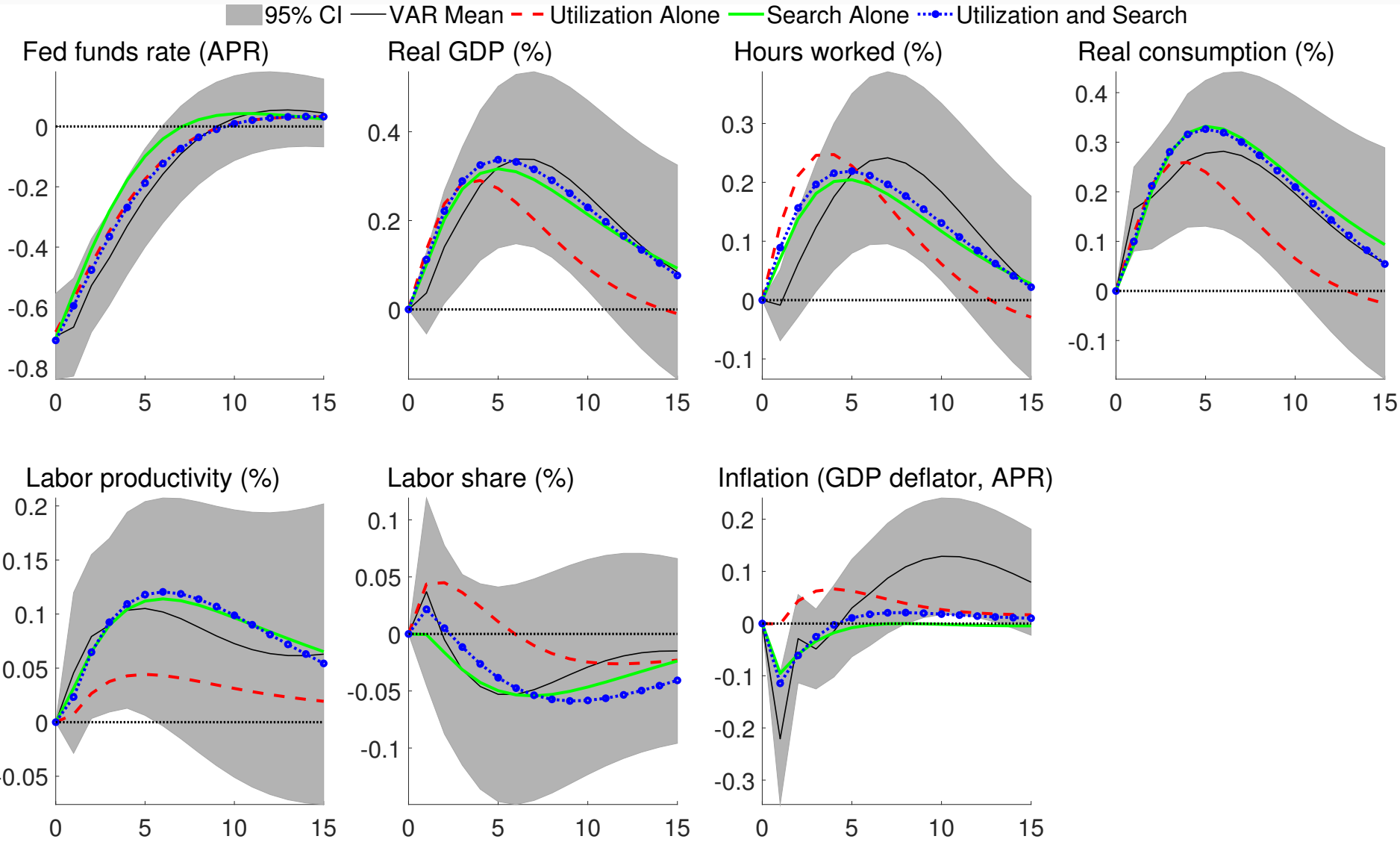
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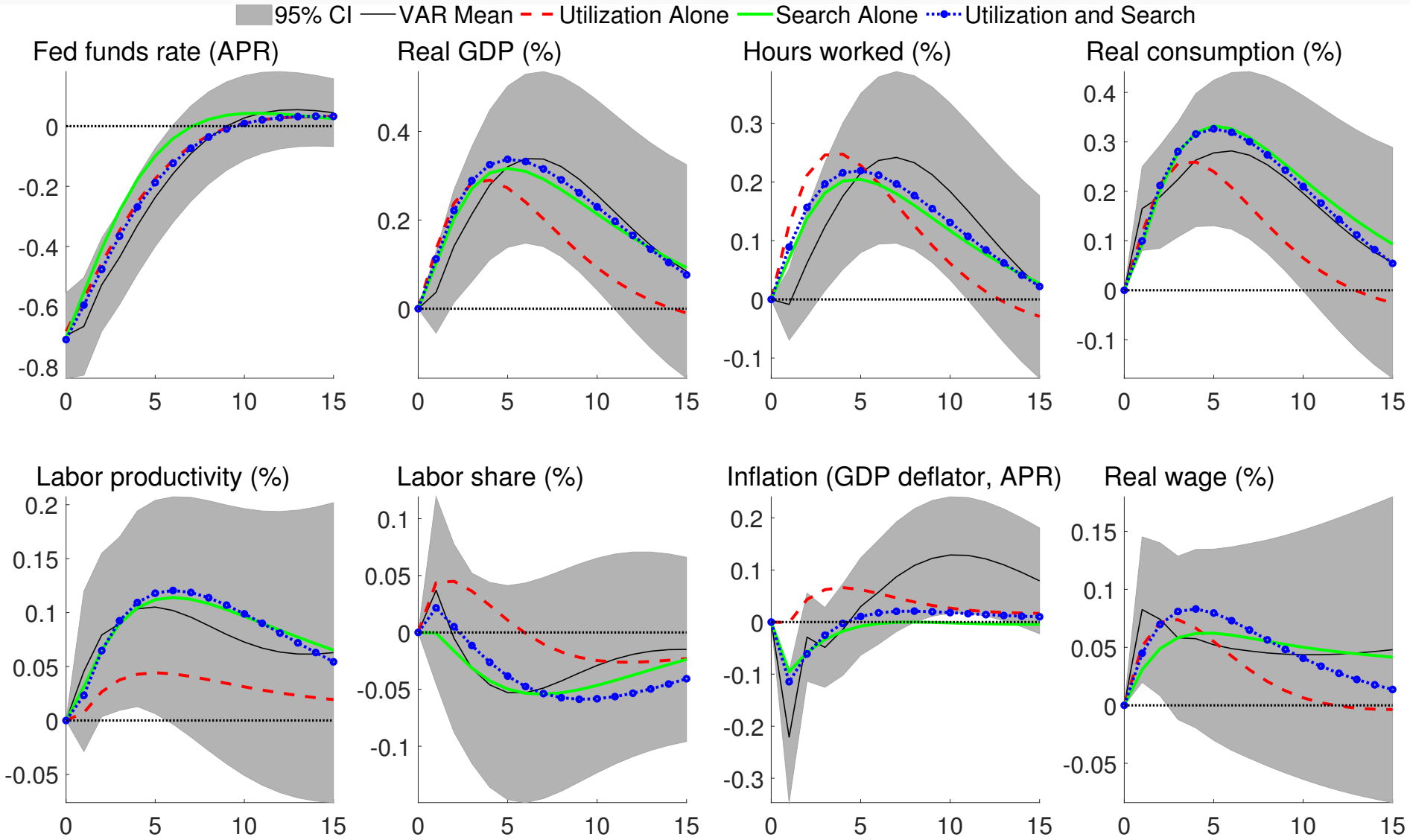
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    4. Most IRFs, e.g. labor productivity and labor share, fit the data better.
- Hence, we think search frictions in goods markets should be considered as part of the standard ingredients in New Keynesian models.

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