Labor Markets in Heterogeneous Sectors

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Outline

- Introduction/Motivation
- Model
- Estimation/IRF's
- Conclusions

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- Last 15 years, according to Alves and Correa (2013): the Brazilian Labor Market Dichotomy
  - Deep sectoral heterogeneity: Manufacturing $\times$ Services

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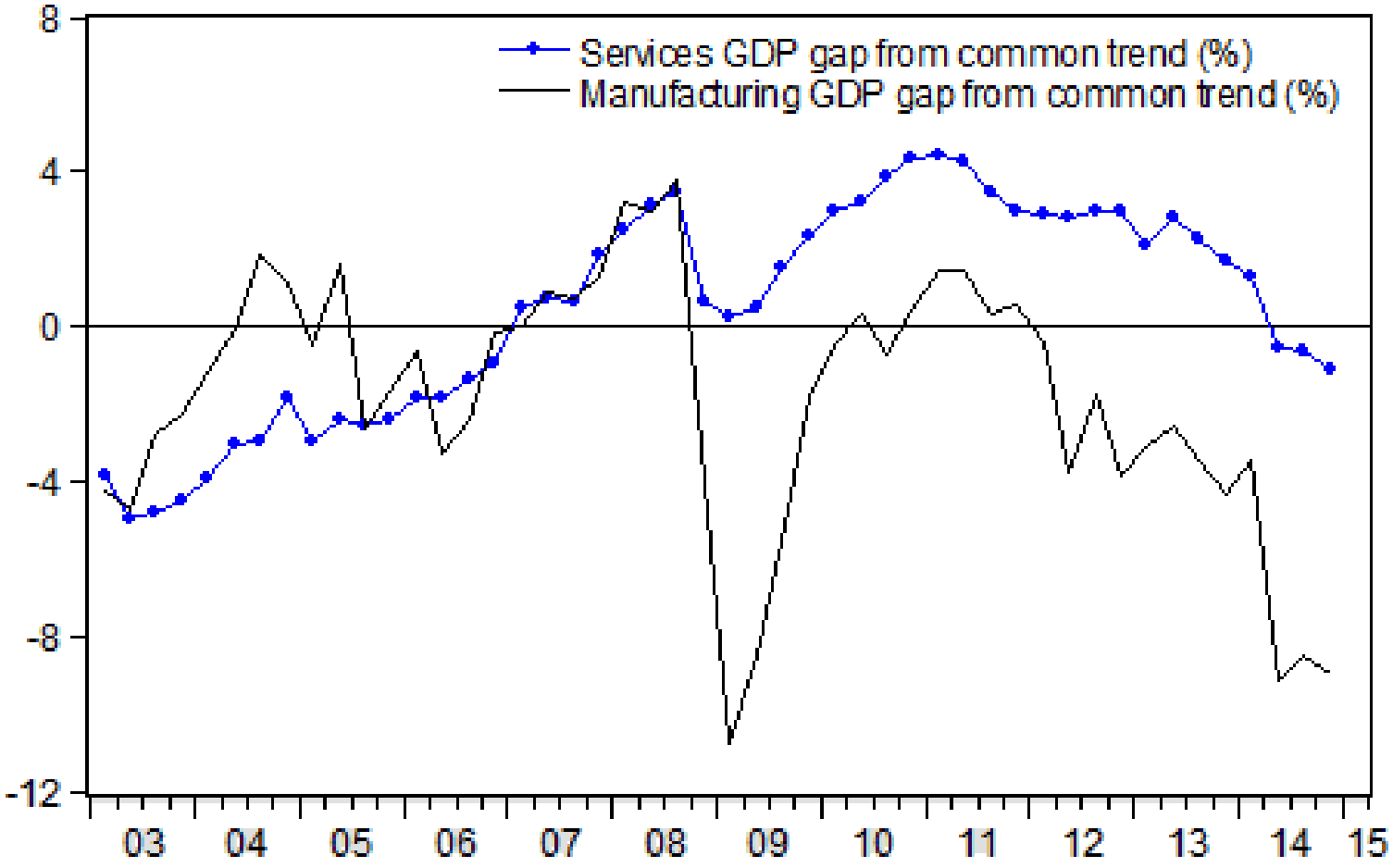
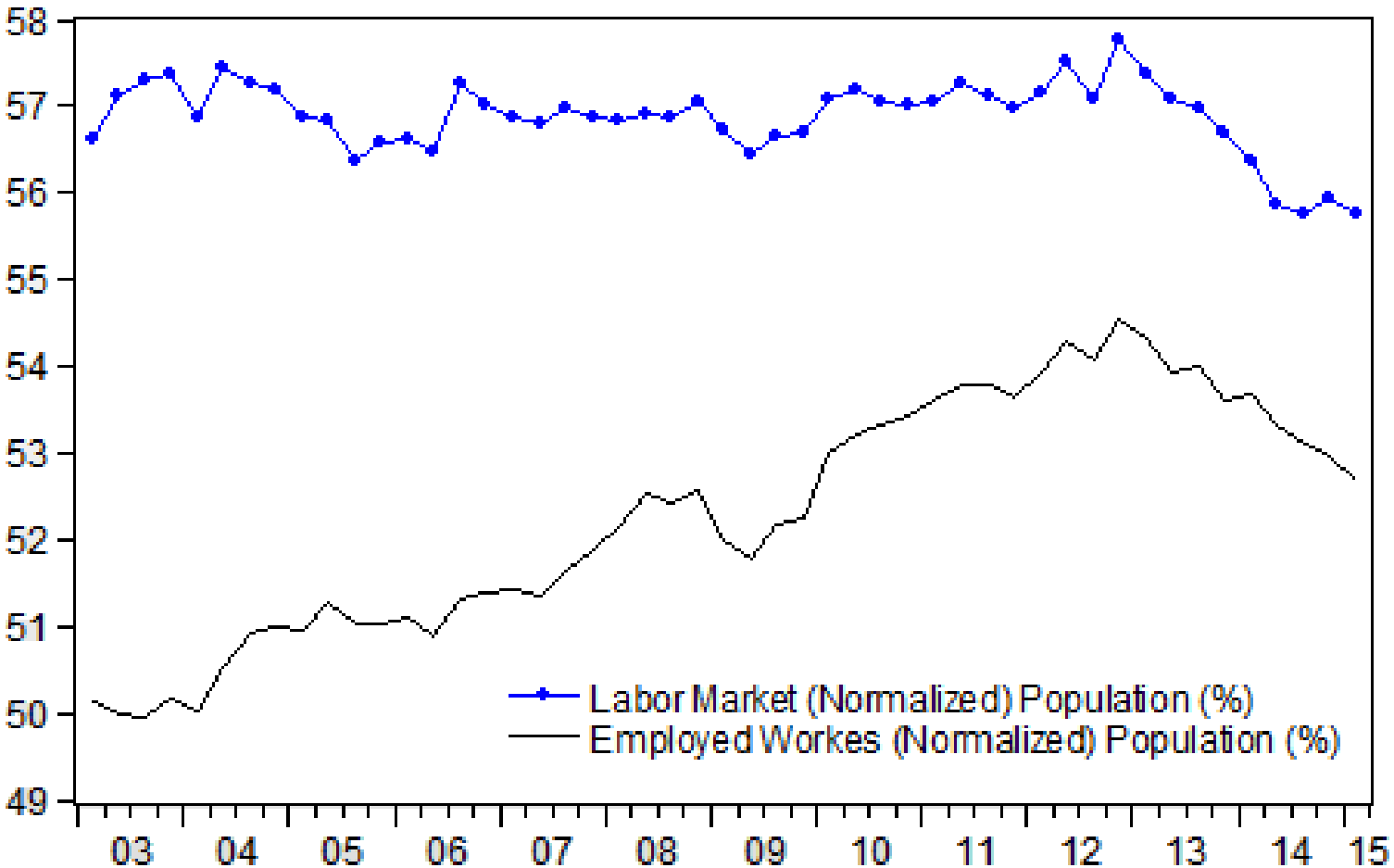
- Look at the data with more detail not only the Labor market, but also the Goods markets from the Manufacturing and Services sectors are deeply heterogeneous in Brazil.
  - Extensive and intensive margins of labor play different, but important roles.
- Study is a first step at identifying those sectoral idiosyncrasies by means of a formal DSGE model intended for better estimation and policy advising.

Sectoral GDP



Participation Rate and Total Employment

(Over Working Age Population)



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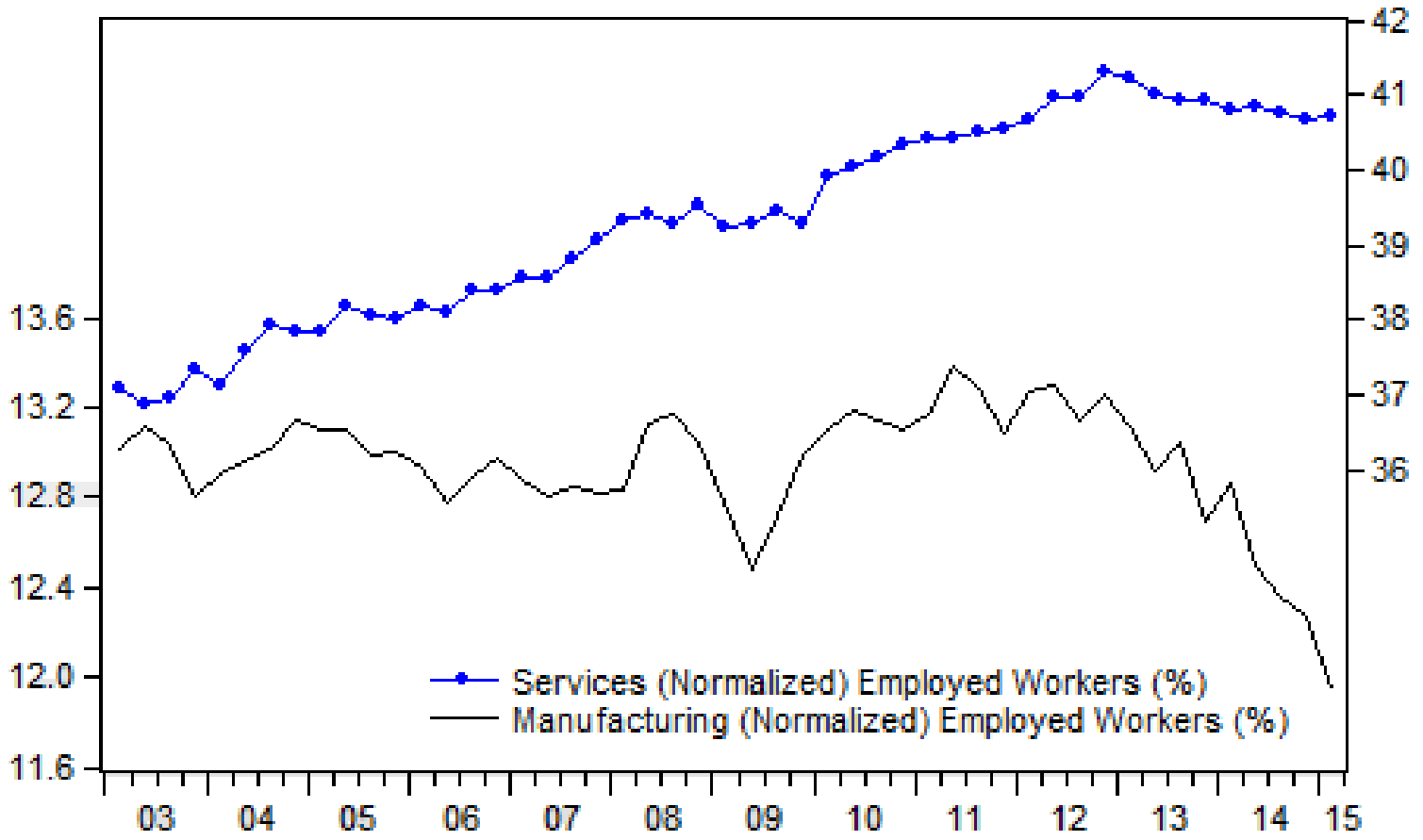
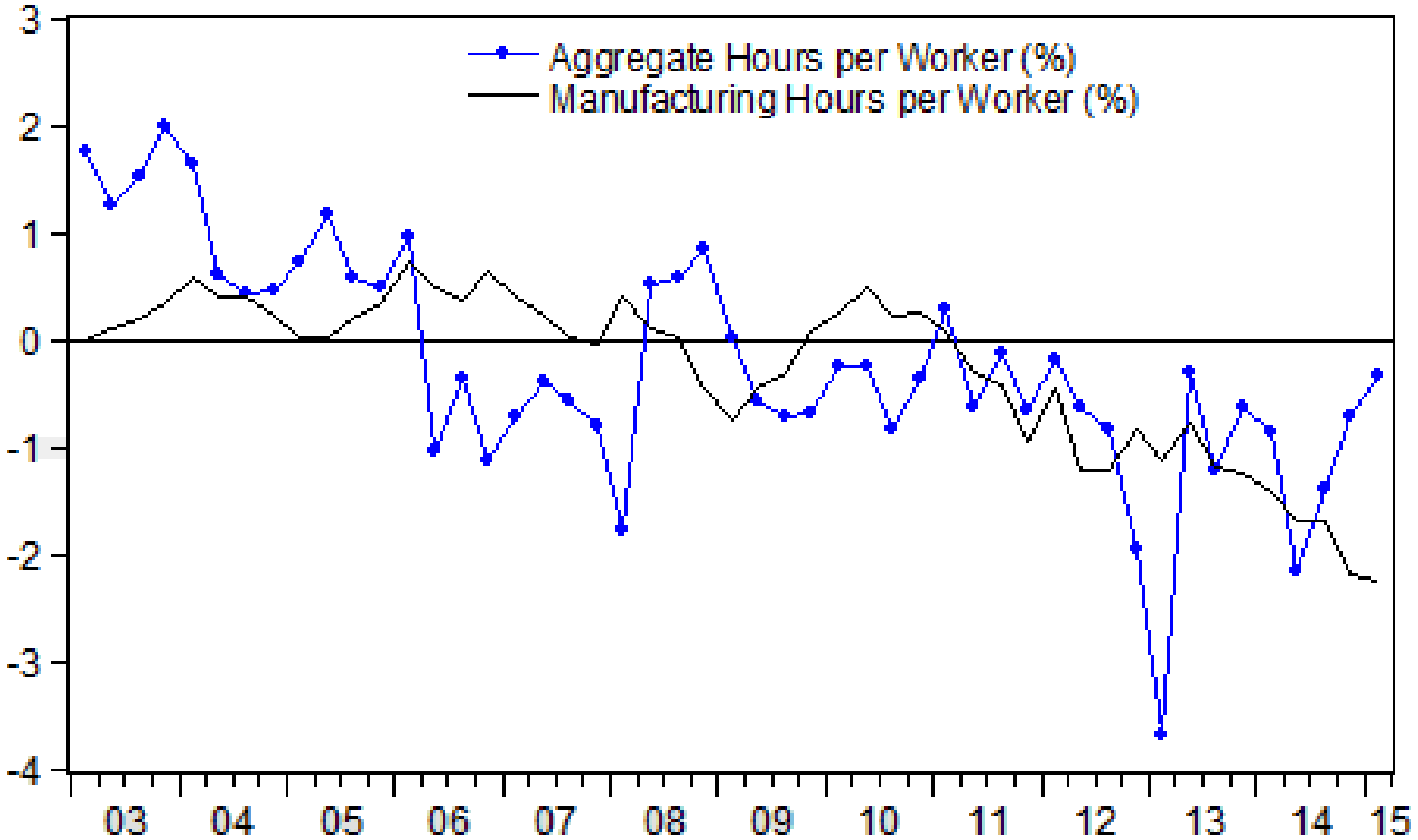


Hours per Worker



Fully Blown DSGE model

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- **Contribution:** Endogenous decision to either leave the labor market or reallocate to a different sector (**M**anufacturing and **S**ervices), after an asymmetric stochastic training period.
- Sectors are asymmetric: firms are subject to sector-specific price stickiness and labor productivity.

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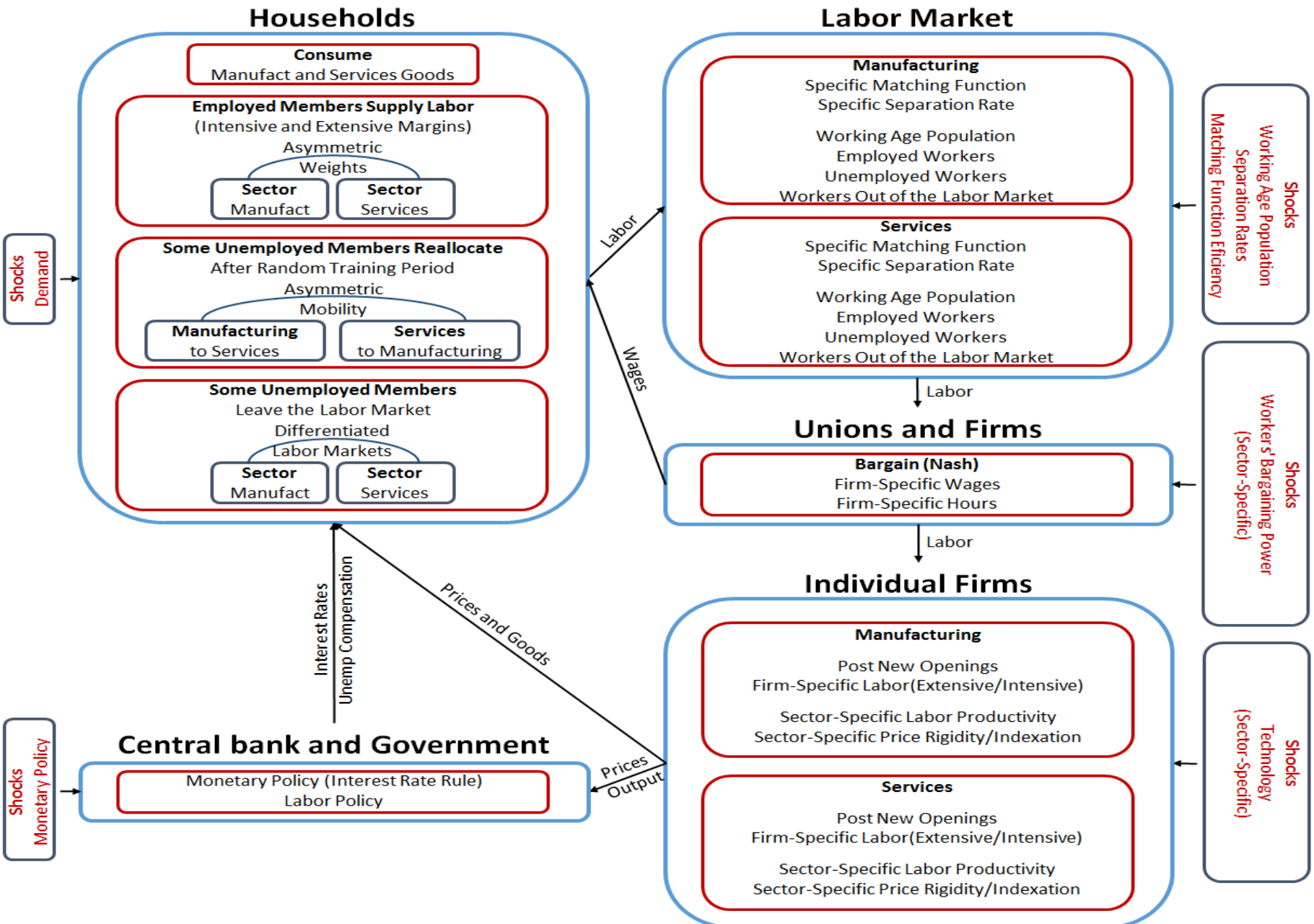
- Estimate (Bayesian) the model (180 equations/variables) using 13 observed quarterly variables (Labor, Goods, Mon. Policy): 2003:Q1 to 2014:Q4.


Households
Consume
Manufact and Services Goods
Employed Members Supply Labor
(Intensive and Extensive Margins)
Asymmetric
Weights
Sector
Manufact
Sector
Services
Some Unemployed Members Reallocate
After Random Training Period
Asymmetric
Mobility
Manufacturing
to Services
Services
to Manufacturing
Some Unemployed Members
Leave the Labor Market
Differentiated
Labor Markets
Sector
Manufact
Sector
Services
Shocks
Demand
Labor
Wages
Labor Market
Manufacturing
Specific Matching Function
Specific Separation Rate
Working Age Population
Employed Workers
Unemployed Workers
Workers Out of the Labor Market
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Shocks
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Separation Rates
Matching Function Efficiency
Labor
Unions and Firms
Bargain (Nash)
Firm-Specific Wages
Firm-Specific Hours
Shocks
Workers' Bargaining Power
(Sector-Specific)
Labor
Individual Firms
Manufacturing
Post New Openings
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Sector-Specific Labor Productivity
Sector-Specific Price Rigidity/Indexation
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Sector-Specific Labor Productivity
Sector-Specific Price Rigidity/Indexation
Shocks
Technology
(Sector-Specific)
Interest Rates
Unemp Compensation
Prices and Goods
Prices
Output
Central bank and Government
Monetary Policy (Interest Rate Rule)
Labor Policy
Shocks
Monetary Policy

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- $a_{\mathfrak{c}}$ and $\bar{b}_{\mathfrak{c}}$: Elast. unemp. matching function $m_{\mathfrak{c},t} \equiv \eta_{\mathfrak{c},t} v_{\mathfrak{c},t}^{1-a_{\mathfrak{c}}} u_{\mathfrak{c},t}^{a_{\mathfrak{c}}}$ and Worker's bargaining power at sector $\mathfrak{c}$.

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- $\alpha_{\mathfrak{c}}$ and $\iota_{\mathfrak{c}}$: Price rigidity and price indexation at sector $\mathfrak{c}$.

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  - n_t, $\mathsf{n}_{\mathfrak{m},t}$, $\mathsf{n}_{\mathfrak{s},t}$ members are employed: **endogenous**.

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- Production function: $y_t(z_c) = \mathrm{a}_{c,t} \mathrm{A}_t H_t(z_c)^{\varepsilon_c}$, where $H_t(z_c) = \mathrm{n}_t(z_c) h_t(z_c)$.

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- Probability $(1-\alpha_\mathfrak{c})$: price is adjusted to $p_t(z_\mathfrak{c}) = p_{t-1}(z_\mathfrak{c})\,\Pi_{\mathfrak{c},t}^{ind}$, where $\Pi_{\mathfrak{c},t}^{ind} = (\Pi_{\mathfrak{c},t-1})^{\iota_\mathfrak{c}}(\bar{\Pi})^{\bar{\iota}}$.

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- Total real salary per period $\varpi_t(z_\mathfrak{c}) = w_t(z_\mathfrak{c}) h_t(z_\mathfrak{c})$ decided by Nash bargaining, while hours per worker $h_t(z_\mathfrak{c})$ are set to maximize total surpluses.

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- Unemployment conpensation: $P_t\left(\mathfrak{w}_{\mathfrak{m}} \varpi^c_{\mathfrak{m},t} \mathsf{u}^e_{\mathfrak{m},t} + \mathfrak{w}_{\mathfrak{s}} \varpi^c_{\mathfrak{s},t} \mathsf{u}^e_{\mathfrak{s},t}\right)$

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- Members out of the labor market **also onsume** $C_{\mathfrak{c},t}$, **but make no monetary contribution**. However, **being out of the labor market might be optimal if being unemployed is a burden**
  - Being unemployed: extra disutility $v^{\mathsf{u}}_t \mathsf{u}^e_t \equiv \mathfrak{w}_{\mathfrak{m}} \bar{v}^{\mathsf{u}}_{\mathfrak{m}} \mathsf{u}^e_{\mathfrak{m},t} + \mathfrak{w}_{\mathfrak{s}} \bar{v}^{\mathsf{u}}_{\mathfrak{s}} \mathsf{u}^e_{\mathfrak{s},t}$ to the household

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  - Nominal interest rate.

Estimation

Intuition	Parameter	Mean (95% interval)
$\frac{1}{\delta^{\mathfrak{m}}_{\mathfrak{m}}} \approx 2.1$ q: average time to return to $\mathfrak{m}$	$\delta^{\mathfrak{m}}_{\mathfrak{m}}$	0.479 (0.457,0.502)
$\frac{1}{\delta^{\mathfrak{s}}_{\mathfrak{s}}} \approx 1.1$ q: average time to return to $\mathfrak{s}$	$\delta^{\mathfrak{s}}_{\mathfrak{s}}$	0.890 (0.846,0.934)
$\frac{1}{\delta^{*}+\bar{\delta}^{\mathfrak{s}}_{\mathfrak{m}}(1-\delta^{*}-\delta^{\mathfrak{m}}_{\mathfrak{m}})} \approx 2.4$ q: realloc time $\mathfrak{m} \longrightarrow \mathfrak{s}$	$\bar{\delta}^{\mathfrak{s}}_{\mathfrak{m}}$	0.796 (0.740,0.857)
$\frac{1}{\delta^{*}+\bar{\delta}^{\mathfrak{m}}_{\mathfrak{s}}(1-\delta^{*}-\delta^{\mathfrak{s}}_{\mathfrak{s}})} \approx 10.3$ y: realloc time $\mathfrak{s} \longrightarrow \mathfrak{m}$	$\bar{\delta}^{\mathfrak{m}}_{\mathfrak{s}}$	0.070 (0.000,0.141)
How easy it is to find a job at $\mathfrak{m}$	$a_{\mathfrak{m}}$	0.966 (0.946,1.000)
How easy it is to find a job at $\mathfrak{s}$	$a_{\mathfrak{s}}$	0.974 (0.957,1.000)
Workers' bargaining power at $\mathfrak{m}$	$\bar{b}_{\mathfrak{m}}$	0.939 (0.895,0.989)
Workers' bargaining power at $\mathfrak{s}$	$\bar{b}_{\mathfrak{s}}$	0.631 (0.577,0.685)

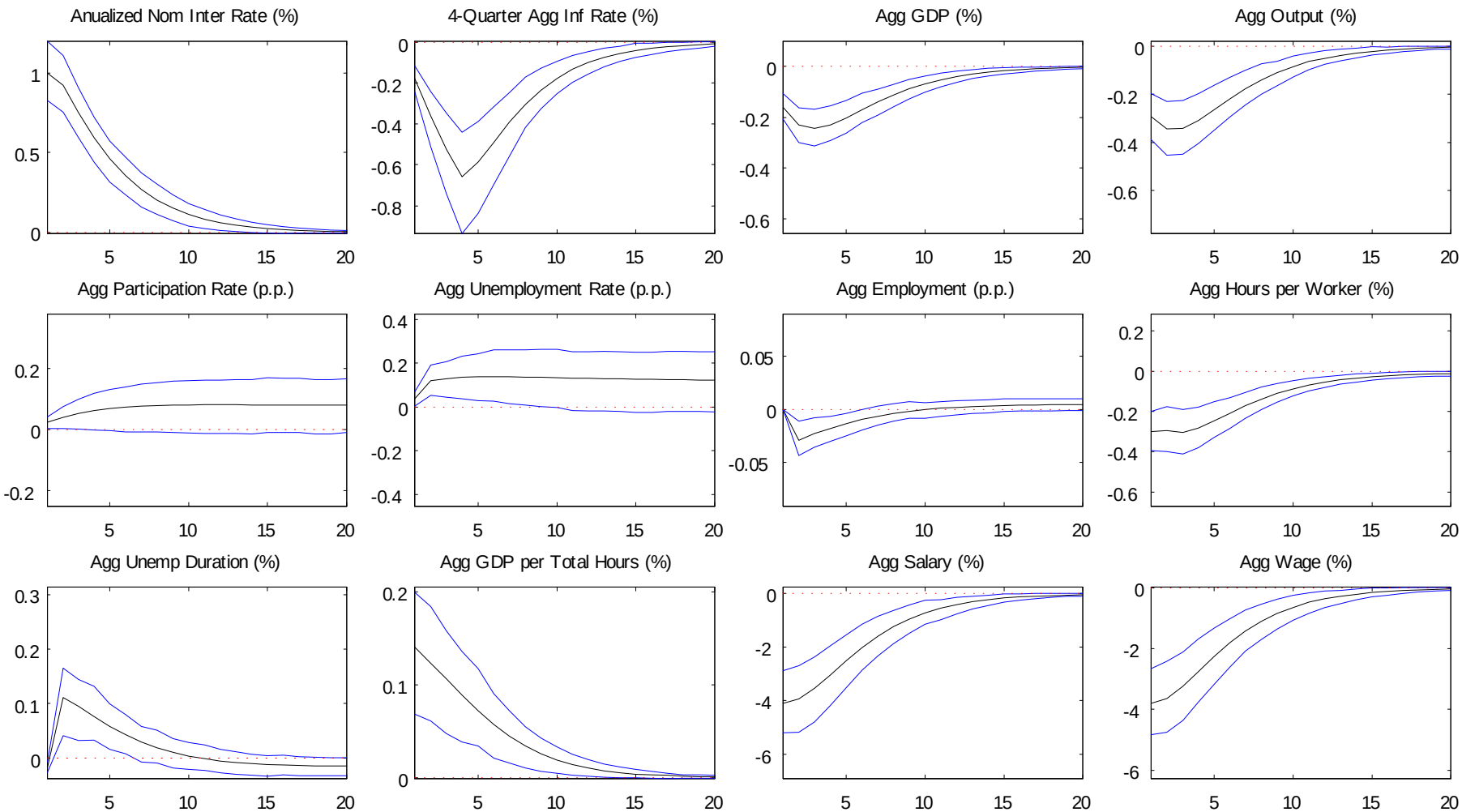
Estimation

Intuition	Parameter	Mean (95% interval)
Reallocation costs from $\mathfrak{m}$	$\varsigma_{\mathfrak{mm}}$	0.067 (0.050,0.083)
Reallocation costs from $\mathfrak{s}$	$\varsigma_{\mathfrak{ms}}$	0.056 (0.036,0.078)
Unemp Comp over Emp Salary at $\mathfrak{m}$	$\gamma^c_{\mathfrak{m}}$	0.033 (0.000,0.069)
Unemp Comp over Emp Salary at $\mathfrak{s}$	$\gamma^c_{\mathfrak{s}}$	0.173 (0.049,0.290)
Share of Unemp Workers from $\mathfrak{m}$	$\overline{\mathfrak{p}}^{ue}_{\mathfrak{m}}$	0.045 (0.000,0.087)
SS Labor Tightness at $\mathfrak{m}$	$\overline{\theta}^{\epsilon}_{\mathfrak{m}}$	0.861 (0.500,1.230)
SS Labor Tightness at $\mathfrak{s}$	$\overline{\theta}^{\epsilon}_{\mathfrak{s}}$	2.307 (1.848,2.741)
Reciprocal Intertemp Elast Substit	σ	5.166 (3.423,7.041)
Reciprocal Frisch Elast Substit	ν	5.287 (3.502,7.074)

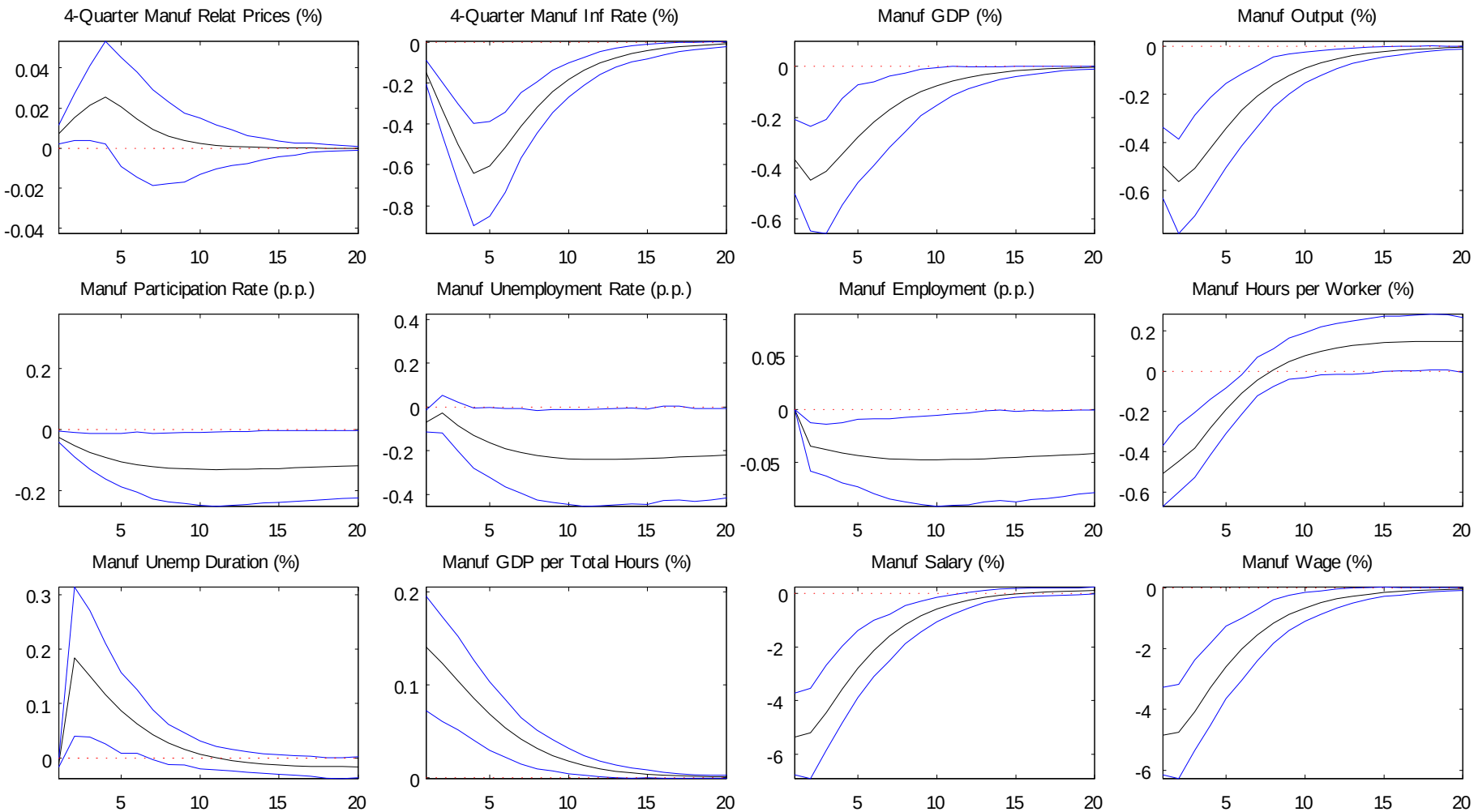
Estimation

Intuition	Parameter	Mean (95% interval)
Labor productivity at $\mathfrak{m}$	$\varepsilon_{\mathfrak{m}}$	0.985 (0.968,1.000)
Labor productivity at $\mathfrak{s}$	$\varepsilon_{\mathfrak{s}}$	0.946 (0.895,1.000)
Price rigidity at $\mathfrak{m}$	$\alpha_{\mathfrak{m}}$	0.637 (0.561,0.702)
Price rigidity at $\mathfrak{s}$	$\alpha_{\mathfrak{s}}$	0.513 (0.402,0.618)
Price indexation at $\mathfrak{m}$	$\iota_{\mathfrak{m}}$	0.402 (0.316,0.487)
Price indexation at $\mathfrak{s}$	$\iota_{\mathfrak{s}}$	0.065 (0.000,0.136)

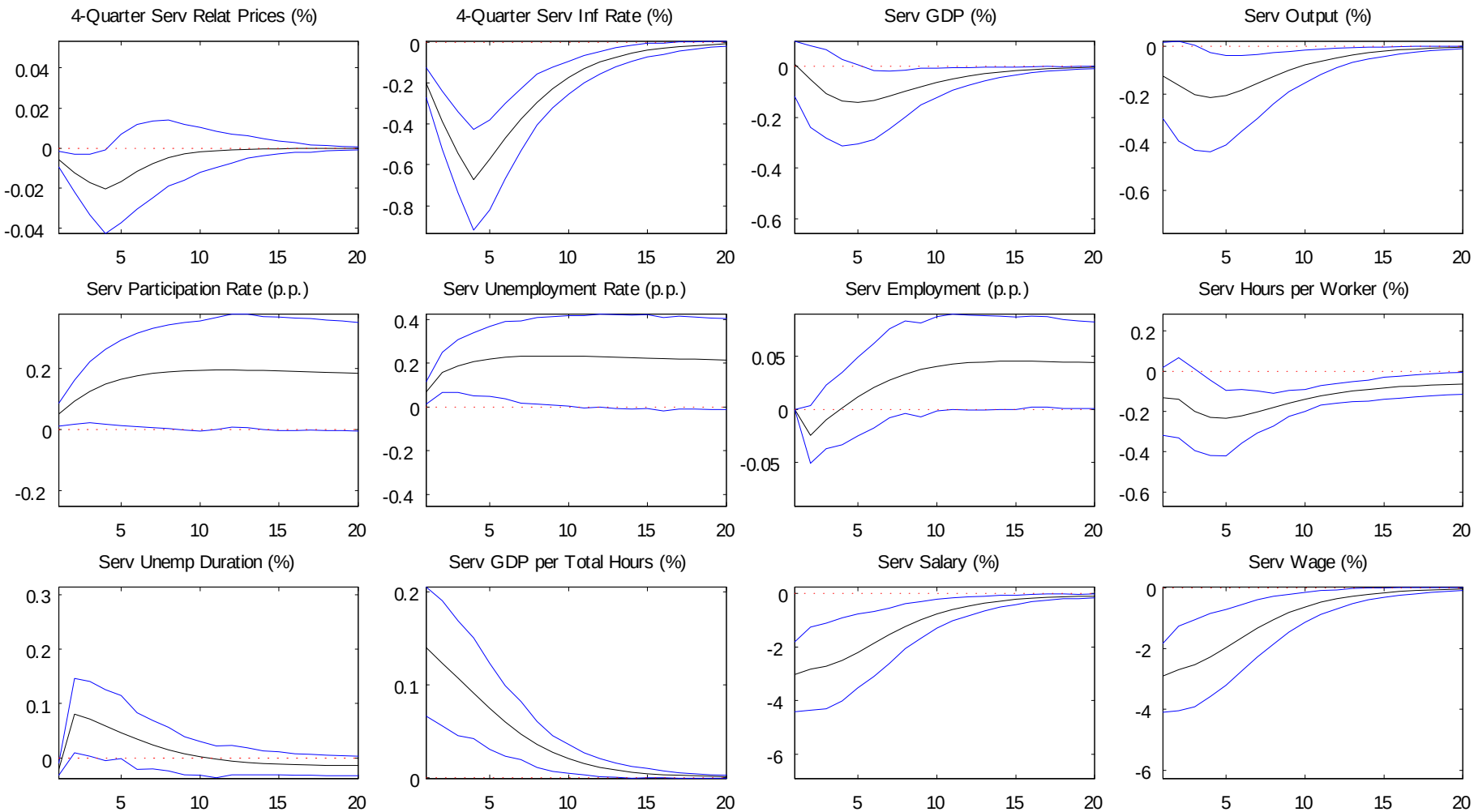
Monetary Policy Shock



Monetary Policy Shock



Monetary Policy Shock



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- Unemployed workers from serv sector **find it easier get a job** ($a_{\mathfrak{s}} \approx 0.974 > a_{\mathfrak{m}} \approx 0.966$) and $\left(\bar{\theta}^e_{\mathfrak{s}} \approx 2.31 >> \bar{\theta}^e_{\mathfrak{m}} \approx 0.86\right)$, but have **smaller power when bargaining for salary and hours** ($\bar{b}_{\mathfrak{m}} \approx 0.94 > \bar{b}_{\mathfrak{s}} \approx 0.63$), and hence their salaries are closer to unemp compensation).

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  - Using Hosios efficiency condition ($\bar{b} = a$), the Manuf labor market also seems more efficient than the Serv labor market, i.e. $\bar{b}_{\mathfrak{m}} \approx a_{\mathfrak{m}}$, while $\bar{b}_{\mathfrak{s}} << a_{\mathfrak{m}}$.

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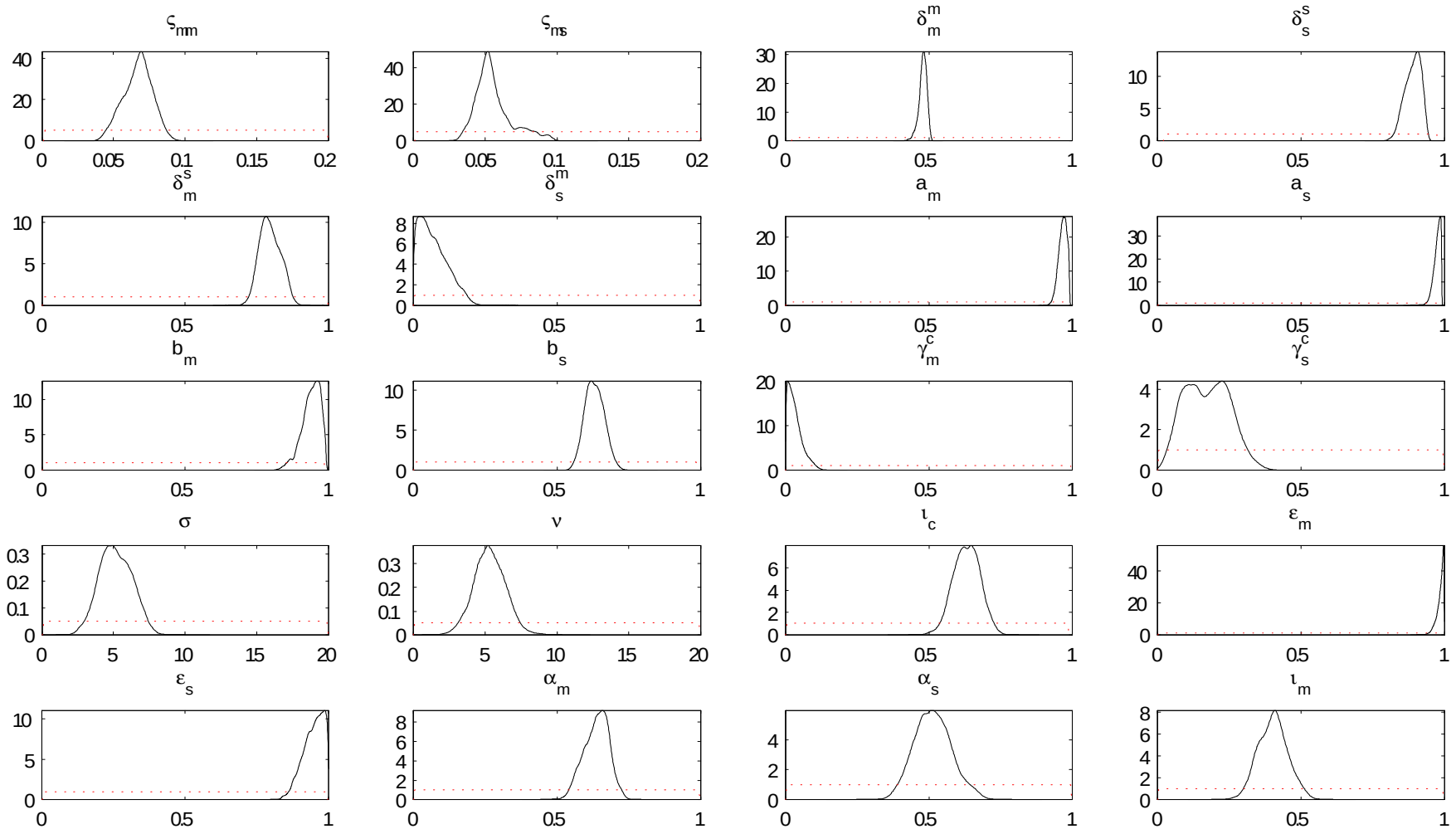
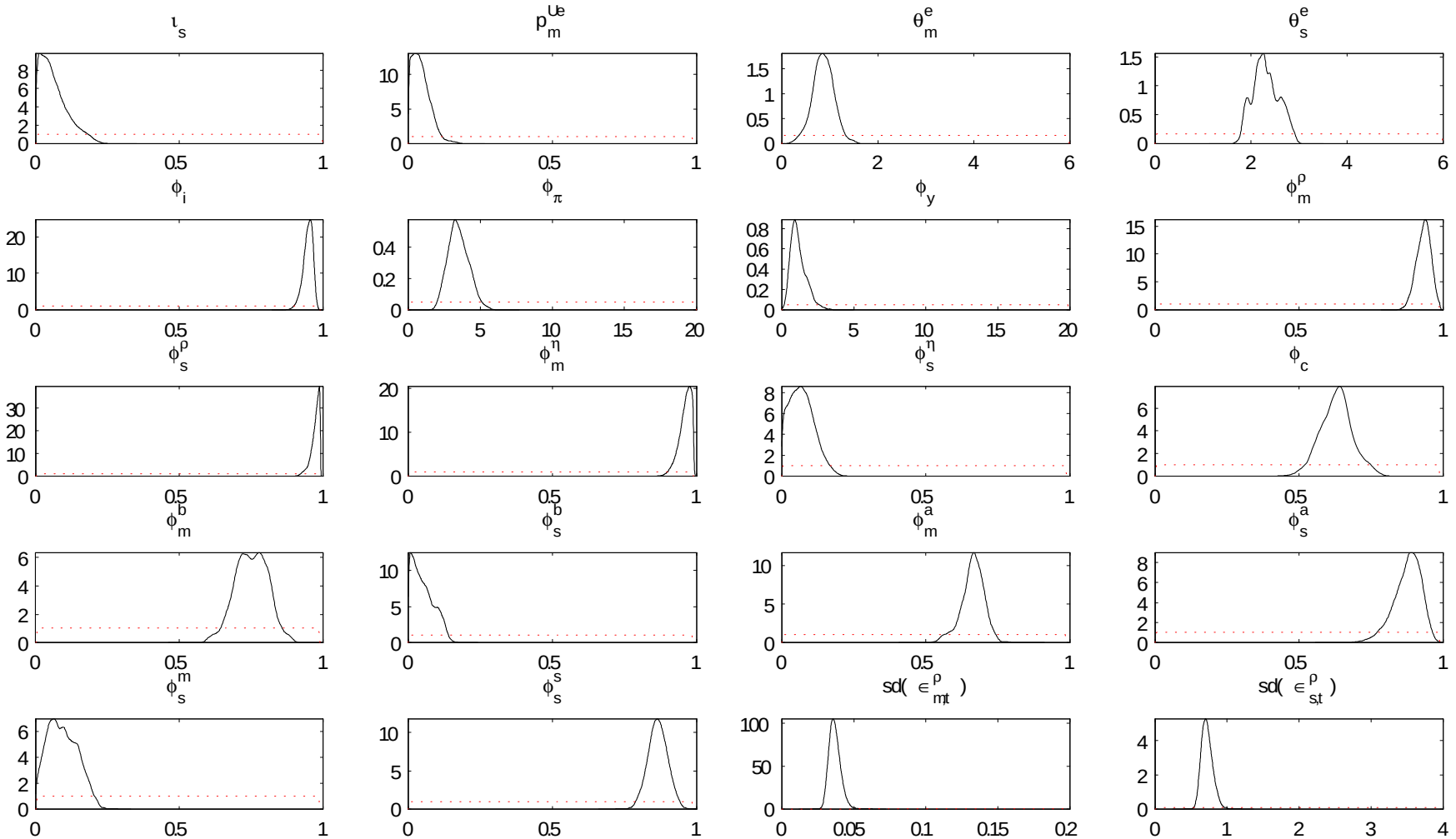
- After a monetary policy shock, it is the manufacturing sector which suffers more: stronger fall in employment, hours, real salaries, GDP and output.
- The model capture what is know as labor hoarding, for hours tend to fall much faster than employment after the shock.

Estimation



Estimation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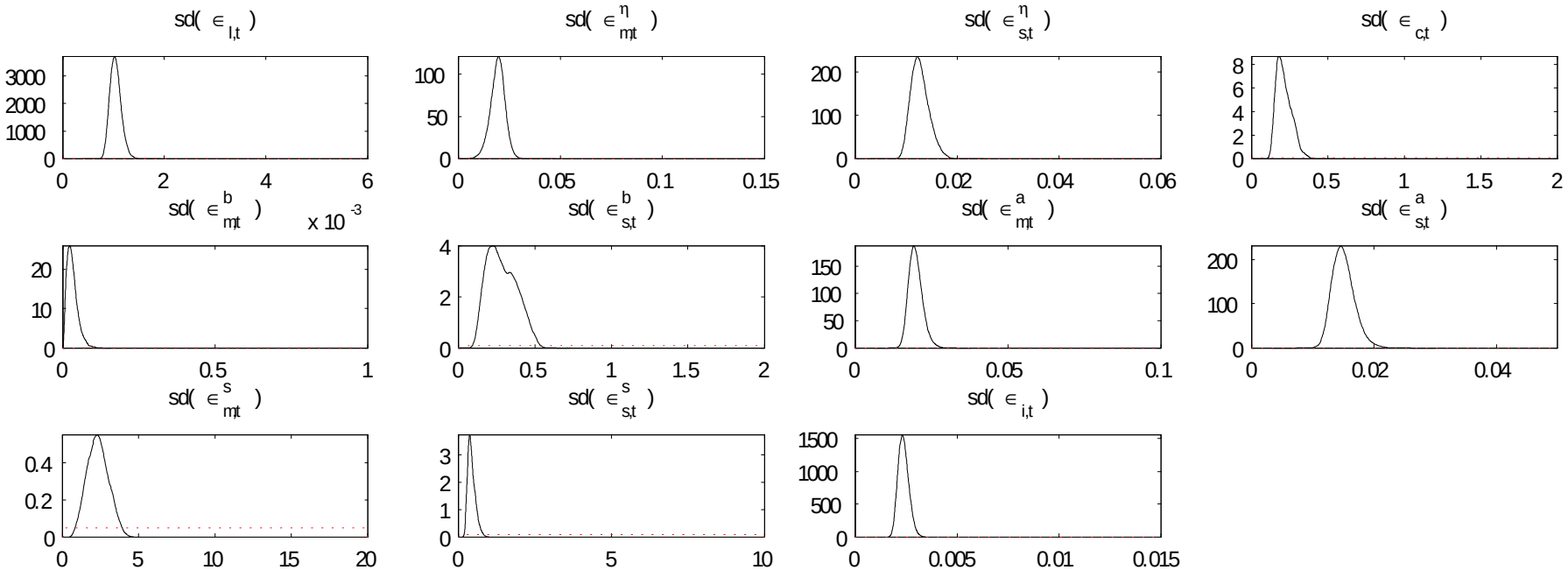
Estimation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