The Role of Labor Markets for Euro Area Monetary Policy

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Do labor markets matter for monetary policymaking?

Labor market rigidities take center stage in policy discussions. Three key questions regarding the role of labor market from monetary policy perspective

1. to which extend do labor markets affect the monetary transmission mechanism?
2. how important is the structure of the labor market? Do labor market reforms alter the dynamics of output and inflation?
3. to which extend do labor market specific shocks affect the dynamics of output and inflation?

This paper ...

1. DSGE model with search and matching frictions and equilibrium unemployment Trigari (2006).
2. calibrate model to euro area labor market evidence.
3. which labor market rigidities affect monetary transmission and the business cycle? Flipside: which structural reforms affect the business cycle?
4. estimate model (Bayesian techniques): which labor market-specific shocks matter for inflation?

First glance at results

- the labor market matters for monetary policy insofar as wage-setting and wage shocks are concerned directly.
- other shocks in the labor market (separation, hiring costs) have far smaller (if any) bearing on inflation dynamics.
- other dimensions of reform, too, have far smaller bearing on inflation dynamics.
- two components of marginal costs: real wages and hours per employee.

$$\widehat{mc}_t = \widehat{e}_t^C + \widehat{w}_t + (1-\alpha)\widehat{h}_t,\ \alpha \in (0,1).$$

First glance at results c'td

- effect of structural reforms on both components ambiguous:

$$\widehat{mc}_t = \widehat{e}_t^C + \widehat{w}_t + (1-\alpha)\widehat{h}_t.$$

- $\widehat{h}_t$. Reforms which reduce, say, costs of hiring/separation:
  - on the one hand, firms are more inclined to satisfy additional demand by hiring $\Rightarrow$ smaller response of mc.
  - but also the steady state pool of unemployed workers shrinks which hinders labor adjustment through additional hiring.
- $\widehat{w}_t$. Reforms affect the (percent) response of the real wage:
  - countervailing effects: use of intensive vs. extensive margin affects marginal disutility of supplying hours worked and marginal product of labor.
  - response of market tightness (in percent) ambiguous.

The model: overview

New Keynesian model with labor-market matching frictions (similar to Trigari, 2006). Three sectors of production:

1. intermediate good sector (competitive), the "Labor good"
   - produce homogenous labor good.
   - hours worked as only input, decreasing returns to hours per worker.
   - firms post vacancies in order to find a worker (costly and time-consuming search process).
   - nominal wage rates bargained infrequently.
2. Wholesale sector (monopolistic competition):
   - produces differentiated good using Labor good as input.
   - prices subject to nominal rigidity (Calvo).

The model: overview c'td

Three sectors of production c'td ...:

3. Retail sector (competitive): bundles differentiated goods into consumption basket and sells to consumers and government.

Consumers/Workers:

- live in big representative families, perfectly insured.
- families take savings decision and bargain about wages.

Government:

- fiscal policy: unemployment benefits, lump-sum taxation.
- monetary policy: Taylor rule.

Labor market: matching and employment

- matching function

$$m_t = \sigma_m (u_t)^{\xi} (v_t)^{1-\xi}, \ \sigma_m > 0, \ \xi \in (0,1)$$

- employment dynamics

$$n_t = (1 - \vartheta_t) n_{t-1} + m_{t-1}$$

where ϑ_t denotes the time-varying probability of separation.

- unemployment

$$u_t = 1 - n_t.$$

Right to manage bargaining (Trigari (2006))

- bargaining (about the nominal wage rate) between family and firm

$$\arg\max_{W_{i,t}} \left[\Delta_t(W_{i,t})\right]^{\eta_t} \left[J_t(W_{i,t})\right]^{1-\eta_t} \quad \Rightarrow W_t^*$$

- optimal choice of labor (hours) input for a given wage rate:

$$x_t^L z_t \alpha h_{i,t}^{\alpha-1} = \frac{W_{i,t}}{P_t}.$$

- η_t : bargaining power of workers.
- Δ_t: surplus of family from having a worker employed.
- J_t: value of firm (worthless when no worker).
- only fraction $1-\gamma$ of firms/workers bargains in any period.

The model: vacancy posting

$$\kappa_t = q_t E_t \left\{ \beta_{t,t+1} \left[\gamma J_{t+1}\left(W_t\right) + (1-\gamma) J_{t+1}(W^*_{t+1}) \right] \right\}.$$

- κ_t are real vacancy posting costs.
- q_t is the probability that a posted vacancy results in a match.
- $J_{t+1}(W^*_{t+1})$: value of firm next period if wage is readjusted.
- per-period profit of labor firm $\Psi^L_t = x^L_t z_t h^{\alpha}_{i,t} - \frac{W_{i,t}}{P_t} h_{i,t} - \Phi$

Calibration: the role of labor market structure

- Step 1: calibration to euro area evidence (steady state, parameters and shocks).
- Step 2: counterfactuals. How do monetary transmission and the business cycle change if labor market is made "more flexible"?

Calibration: data

- microevidence/literature review on price- and wage-setting frequencies, labor market parameters (replacement rates, separation rates, ...).
- AWM data set from 1984:q1 to 2006:q4. hp-1,600 filtered. (output, (GDP-) inflation, interest rates, wages per employee, unemployment and government consumption)
- Labor market data for the euro area; some proxies:
  - Vacancies: aggregated from country data on vacancies. (Eurostat), coverage: 60 percent of euro area
  - hours worked: annual figures from KLEMS database interpolated with euro area GDP (alternatively German hours as interpolator)

Calibration: parameters

Preferences		
β	0.992	time-discount factor; matches annual real rate of 3.3 percent.
φ	2	labor supply elasticity of 0.5; close to mode in Smets and Wouters (2003).
σ	1.50	risk aversion; mode of estimates in Smets and Wouters (2003)
ϱ	0.60	external habit persistence; mode of estimates in Smets and Wouters (2003).
κ^L	94.70	scaling factor to disutility of work; targets $h = 1/3$.
Bargaining and Labor Good		
α	0.66	labor elasticity of production; targets labor share of 60%.
ξ	0.6	elasticity of matches w.r.t. unempl.; Burda and Wyplosz (1994).
γ	0.83	avg. duration of wages contracts of 6 qtrs.; Mermet (2001).
ϑ	0.03	quarterly separation rate; Hobijn and Sahin (2007)
η	0.50	bargaining power of workers; conventional value.
σ_m	0.42	efficiency of matching; reconciles m with target $u = 0.09$, $q = 0.7$.
κ	0.058	vacancy posting costs; reconciles m with target for u, q.
z	2.27	technology; targets output $y = 1$.
Φ^K	0.33	imputed share of capital in revenue; capital income ratio.
Φ^L	0.0069	fixed cost associated with labor; targets $std(\widehat{u}_t)/std(\widehat{y}_t)$ in the data.
ξ_w	0.0	wage indexation; no indexation in baseline model.

Calibration: parameters c'td

Wholesale Sector		
ϵ	11	markup; conventional price-markup of 10 percent.
ω	0.75	price stickiness; avg. duration of 4 qrts; Álvarez *et al.* (2005).
ξ_p	0.0	price indexation; no indexation in baseline model.
Government		
γ_π	1.50	response to inflation; conventional Taylor rule.
γ_y	0.50	response to output gap; conventional Taylor rule.
$\gamma_{\Delta y}$	0.0	response to output growth; conventional Taylor rule.
γ_R	0.85	interest rate smoothing coefficient; conventional value.
$\overline{g}$	0.20	government spending; targets gov. spending-GDP ratio.
b	0.429	unemploym. benefits; targets replacement rate $\frac{b}{wh} = 0.65$.

Calibration: the role of labor market structure

- Step 1: calibration of model to euro area.
- Step 2: counterfactuals. How does monetary transmission and the business cycle change if labor market is made more flexible in certain dimensions?

Counterfactuals

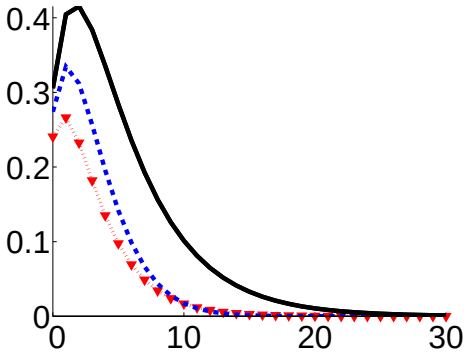
Make the labor market more flexible in the following dimensions

1. lower degree of wage rigidity in bargaining (more frequent wage bargaining).
2. lower vacancy posting costs (so job finding rate increases to the US level).
3. lower unemployment benefits (US level).

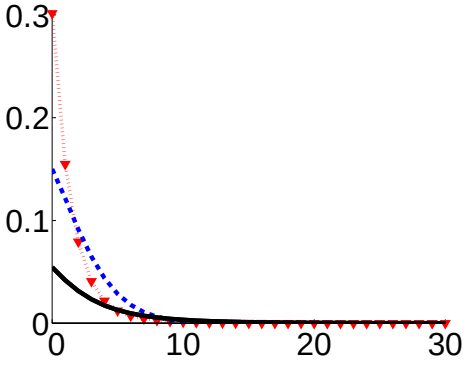
Result: 1) matters a great deal, all else does not much affect the business cycle, monetary transmission and inflation.

IRF to a monetary policy shock - lower wage rigidity

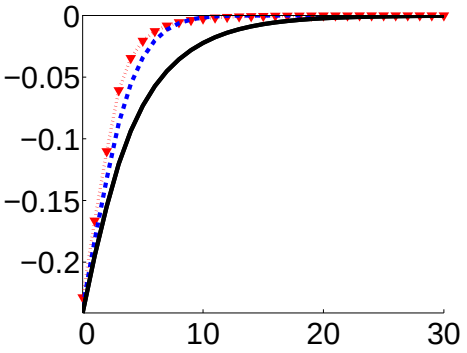
Output, $\widehat{y}_t$



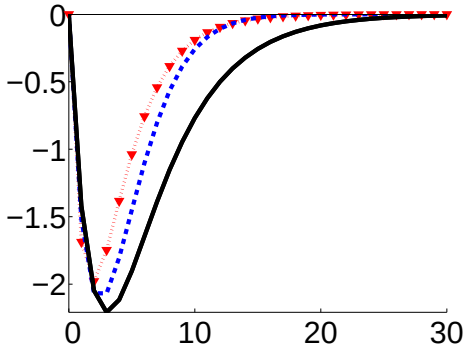
Inflation, $\widehat{\Pi}_t$



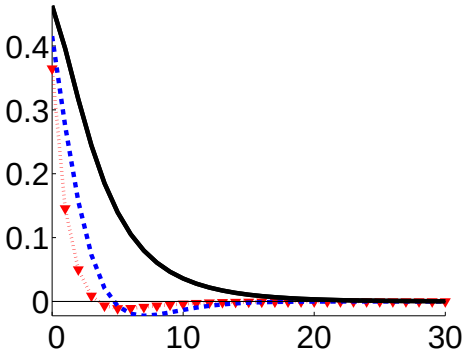
Nominal Rate, $\widehat{R}_t$



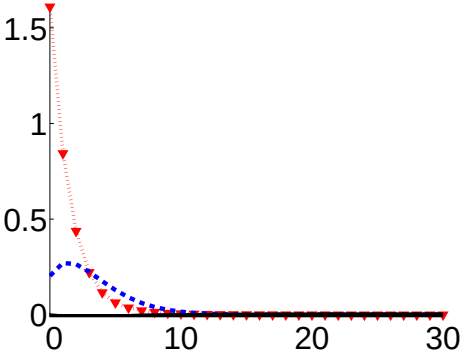
Unemployment, $\widehat{u}_t$



hours per worker, $\widehat{h}_t$



Real Wage Rate, $\widehat{w}_t$



black solid line: calibrated model

blue dashed line: intermediate wage rigidity

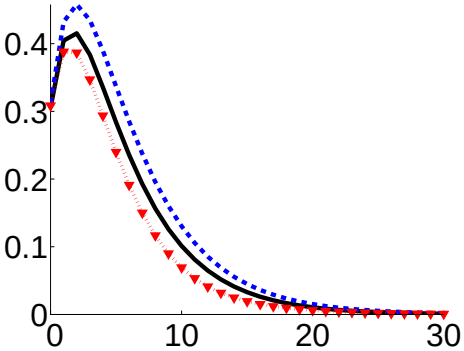
red dotted line: no wage rigidity

More flexible labor market - other dimensions

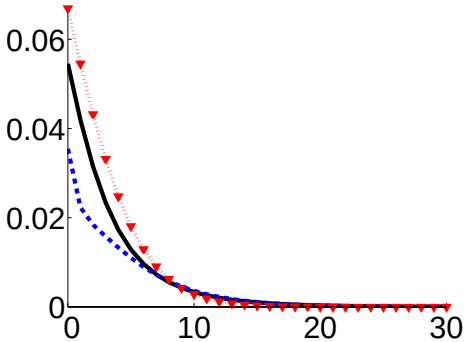
1. lower vacancy posting costs (so job finding rate increases to the US level).
2. lower unemployment benefits (US level).

IRF to a monetary policy shock - flexible labor market

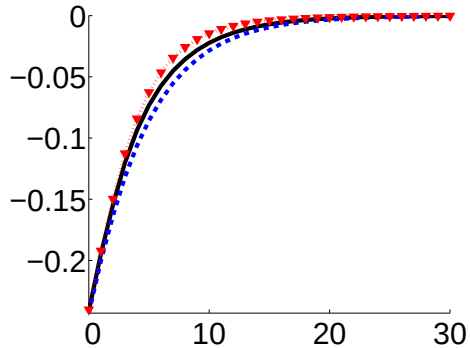
Output, $\widehat{y}_t$



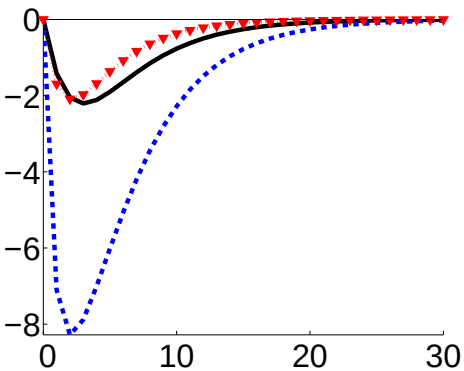
Inflation, $\widehat{\Pi}_t$



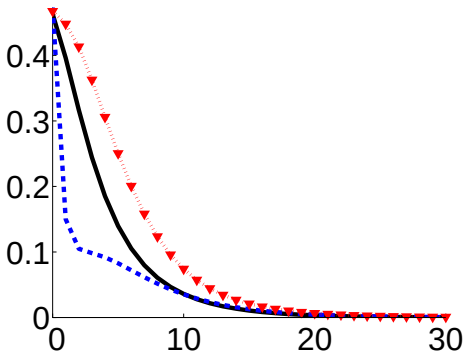
Nominal Rate, $\widehat{R}_t$



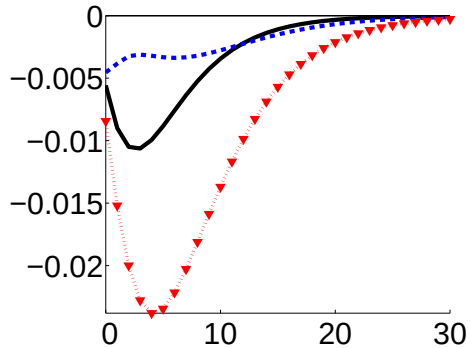
Unemployment, $\widehat{u}_t$



hours per worker, $\widehat{h}_t$



Real Wage Rate, $\widehat{w}_t$



`black solid: calibrated model`

`blue dashed: faster job finding (U.S.),` $u = 4.5\%$

`red dotted: lower replacement rate (U.S.),` $u = 5.2\%$

Intuition

- faster job finding:
  - *equilibrium effects:* higher vacancy posting and lower unemployment.
  - *dynamic effects:* stronger response of employment is muted because of lower number of searching workers.
- lower replacement rate:
  - *equilibrium effects:* lower wages, higher profits, more vacancies and less unemployment.
  - *dynamic effects:* stronger response of employment is again muted because of lower number of searching workers.

Summary: labor market structure and the cycle

- changes in the structure of the labor market which conventionally are associated with a "more flexible" labor market, such as
  - lower costs of hiring,
  - lower replacement rates (and thus wages),

  have a sizeable effect on the steady state of the model, but a limited effect on business cycle dynamics.
- structural change that directly affects the wage setting process ('wage rigidity') has notable effect on business cycle dynamics and monetary effectiveness.

Estimation of the model

Bayesian estimation of slightly enriched version of the model (1984:Q1 to 2006:Q4).

- allow for labor market shocks (bargaining power, vacancy posting costs and separation rate).
- also allow for cost-push shocks.
- estimate posterior distribution of parameters and shocks.
- allows to evaluate the importance of labor market shocks for cyclical fluctuations in inflation and output.

Estimation results

	prior			posterior		posterior		
	mean	std	distr.	mean	std	2.5%	median	97.5%
Monetary policy								
γ_R	.85	.1	beta	0.80	0.03	0.74	0.80	0.86
γ_π	1.5	.2	gamma	1.62	0.19	1.25	1.61	1.99
γ_y	.5	.2	gamma	0.43	0.15	0.17	0.42	0.73
$\gamma_{\Delta y}$	0	.2	normal	0.12	0.04	0.05	0.11	0.19
Preferences								
φ	2	.5	gamma	1.63	0.44	1.01	1.54	2.50
σ	1.5	.2	gamma	1.44	0.20	1.06	1.43	1.82
ϱ	.7	.1	beta	0.22	0.05	0.13	0.22	0.32
Labor market								
γ	.83	.05	beta	0.68	0.05	0.59	0.68	0.77
ξ_w	.5	.25	uniform	0.44	0.20	0.06	0.42	0.82
ξ	.6	.05	beta	0.68	0.03	0.61	0.67	0.74
Wholesale/price-setting firms								
ω	.75	.05	beta	0.69	0.03	0.63	0.69	0.75
ξ_p	.5	.25	uniform	0.17	0.09	0.01	0.17	0.34

Estimation results (c'td)

	prior			posterior		posterior		
	mean	std	distr.	mean	std	2.5%	median	97.5%
Serial correlation of shocks								
ρ_b	.5	.2	beta	0.79	0.04	0.69	0.79	0.87
ρ_g	.5	.2	beta	0.73	0.06	0.62	0.73	0.84
ρ_z	.5	.2	beta	0.60	0.07	0.48	0.61	0.74
ρ_η	.5	.2	beta	0.09	0.05	0.01	0.08	0.18
ρ_κ	.5	.2	beta	0.78	0.06	0.65	0.79	0.91
ρ_ϑ	.5	.2	beta	0.51	0.08	0.365	0.51	0.66
Standard deviation of innovations								
σ_b	50	28.67	uniform	0.26	0.08	0.14	0.25	0.42
σ_C	50	28.67	uniform	1.94	0.39	1.28	1.89	2.72
σ_g	50	28.67	uniform	0.48	0.04	0.41	0.48	0.55
σ_{money}	50	28.67	uniform	0.12	0.01	0.10	0.12	0.14
σ_z	50	28.67	uniform	0.39	0.03	0.33	0.39	0.45
σ_η	50	28.67	uniform	43.48	18.4	16.4	38.9	84.0
σ_κ	50	28.67	uniform	7.62	0.87	6.04	7.53	9.40
σ_ϑ	50	28.67	uniform	3.47	0.26	2.97	3.46	3.98

RMSE and standard deviations relative to data

	RMSE			standard deviation		
Variable	VAR	estimated	calibrated	data	estimated	calibrated
$\widehat{y}_t$	.39	.41 [.41, .42]	.44	.86	.76 [.56, 1.04]	0.78 [0.53, 1.11]
$\widehat{R}_t$	.08	.10 [.10, .11]	.10	.21	.22 [.15, .33]	0.17 [0.12, 0.24]
$\widehat{\Pi}_t^{yoy}$	.26	.21 [.20, .23]	.50	.51	.73 [.51, 1.05]	0.30 [0.22, 0.40]
$\widehat{h}_t+\widehat{n}_t$	.12	.24 [.20, .29]	.54	.74	1.14 [.88, 1.50]	1.16 [0.87, 1.56]
$\widehat{u}_t$	1.05	1.01 [1.00, 1.04]	2.32	4.59	3.79 [2.51, 5.84]	4.18 [2.76, 6.00]
$\widehat{v}_t$	3.44	5.63 [4.89, 6.78]	12.14	12.24	14.72 [11.41, 19.34]	13.26 [10.62, 16.37]
$\widehat{w}_t+\widehat{h}_t$	.29	.44 [.42, .49]	.45	.58	1.10 [.86, 1.40]	0.83 [0.66, 1.03]
$\widehat{g}_t$	.41	.47 [.46, .49]	.46	.77	.67 [.49, .97]	0.72 [0.54, 0.96]

Contribution of labor market shocks

- forecast error variance decomposition.
- shocks to bargaining power matter for inflation and output.
- other labor market shocks matter for labor market but not for inflation.

	labor market shocks							
	bargain	vacancy	separation	premium	cost-push	monetary	governm.	technol.
Horizon 10								
$\widehat{y}_t$	16.7	1.7	.6	48.2	6.3	12.1	2.0	9.2
$\widehat{R}_t$	11.3	.6	.4	46.5	4.7	28.1	.5	5.6
$\widehat{\Pi}_t^{yoy}$	11.9	1.2	.7	39.5	18.0	11.1	.2	13.9
$\widehat{h}_t+\widehat{n}_t$	14.7	.1	.2	45.1	5.5	11.2	1.9	19.1
$\widehat{u}_t$	6.0	43.4	24.2	12.3	3.2	3.4	.2	2.8
$\widehat{v}_t$	5.4	47.3	6.7	22.4	6.1	5.8	.4	2.8
$\widehat{w}_t+\widehat{h}_t$	2.8	3.0	3.4	45.8	16.9	11.3	1.6	13.4
$\widehat{h}_t$	11.0	4.6	4.0	40.3	4.3	9.9	1.8	21.6
$\widehat{w}_t$	59.5	.8	.1	2.6	19.3	.7	.03	14.6

Conclusions

- assessing the importance of labor market structure for the business cycle:
  - structural change that directly affects the wage setting process ('wage rigidity') has notable effect on business cycle dynamics and makes monetary policy more effective.
  - other changes/reforms, even if these are big shifts in paradigm have only a limited effect on dynamics around steady state.

Conclusions c'td

- importance of labor market shocks for inflation:
  - shocks to the hiring costs and separation rate seem to be less important determinant of business cycle dynamics, although they are very important drivers of the labor market.
  - shocks to the bargaining power of workers explain a substantial part of fluctuations in inflation.
- Paper in line with current CB practice: considerable effort into monitoring wage dynamics and shocks, treats other labor market information as less important.