The Role of Wage Rigidity in an Estimated DSGE Model with Search and Matching for Italy

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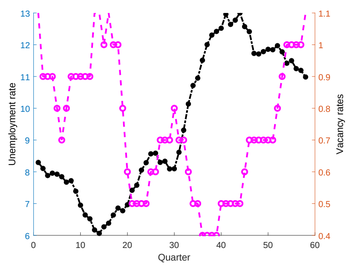
Context

Figure 1. Unemployment and vacancies rates



Source: Own graph

- During last two decades, Italy undertook several reforms to improve labour market conditions (see Schrader and Ulivelli, 2017; Pinelli et al., 2017).
- Structural factors: (i) low level of employment for women and young people; (ii) regional disparity between North-Center and South; (iii) skill mismatch; a highly centralized rigid wage bargaining (Ciccarone et al., 2016; Adda et al., 2017).
- Changes in labour market institutions: **Reform of collective bargaining framework and wage indexation**; **Treu Package (1997)**; **Biagi Law (2003)**; **Fornero reform**; **Job Act**.

Post-Reform Outcomes

- **Treu Package (1997)**; **Biagi Law (2003)**: Employment growth ↑ on average to 1.4% per year between 1997-2007; Unemployment ↓ by 6.1% in 2007 (lowest value); but **labour productivity growth** ↓.
- Recent crisis further showed weakness of Italy's labour market institutions as unemployment rate ↑ 12.7% (highest value) in 2014 (eurostat, 2018).
- With **Job Act**: relaxation of EPL for permanent contracts; reduction of atypical contracts; use of active policies to enhance job matching efficiency (**Earlier findings**: more permanents contracts, mitigation of labour market segmentation).

Related literature

- Merz (1995), Andolfatto (1996) introduce frictional unemployment into DSGE. Langot (1994); Cheron et al. (2004),
- Critique of Shimer (2005). Suggestions: Hall (2005); Hagedorn and Manovskii (2008);
- Christoffel et al. (2006) Germany; Albertini et al. (2012) New-Zealand; Faccini et al. (2011) UK; Gertler et al. (2008) US

Main Contribution

- No DSGE empirical evidence on Italy's labour market data. Few studies: Destefanis and Fonseca (2007); Cardullo and Guerrazzi (2013); Catalano and Pezzolla (2017).
- Our paper follows more closely Faccini et al. (2011) but differs in many aspects.
- We observe significant changes in Italy's labour market institutions that show improvement in labour market conditions.
- Apply and estimate closed DSGE with labour market frictions to evaluate role of labour market dynamics in Italy
- We estimate some structural parameters, unobservable shocks and investigate transmission mechanisms. Pay more attention on "**Matching efficiency shock**" as it proxies improvement in labour market conditions.
- We evaluate how real wage rigidity affects propagation of shocks and ability of model to fit data;

Model-Search and Matching Frictions

- As in Pissarides (1990), matches m_t is a CRS Cobb-Douglas relating total vacancy rate v_t and total unemployment rate $1-n_t$. e is job search effort.
- θ_t is ratio of $\frac{v_t}{u_t}$. $q(\theta_t)$ denotes likelihood of filling a vacant position, $f(\theta_t)$ is likelihood of job finding by job searchers.

$$m_t = \varsigma_t v_t^{\gamma}(e(1-n_t))^{1-\gamma} \quad (1)$$

$$q(\theta_t) = \frac{m_t}{v_t} = \varsigma_t e^{1-\gamma}(\frac{1-n_t}{v_t})^{1-\gamma} \quad (2)$$

$$f(\theta_t) = \theta_t q(\theta_t) = \varsigma_t e^{1-\gamma}(\frac{v_t}{1-n_t})^{\gamma} \quad (3)$$

$$\theta_t = \frac{v_t}{1-n_t} \quad (4)$$

$$n_{t+1} = (1-s)n_t + m_t \quad (5)$$

(6)

$s \in (0,1)$ is exogenous separation rate.

Households and Firms

- Heterogeneous agents who face idiosyncratic shocks in the labor market but insure each other against risks (complete insurance markets).
- Representative household decides to consume, invest and search for employment in the labor market.
- There is a continuum of firms of measure one.
- They all use the same technology "(Cobb Douglas)" and same inputs: capital and total hours (employment). Hence, representative firm.

Nash Wage Determination

- Flexible wage= weighted average of MPL and worker's outside option.
- $S_t = \left(W_2(S_t^H)/\lambda_t\right) + \left(\Upsilon_2(S_t^F)\right)$ is total surplus. Hours is chosen efficiently by $\frac{\partial S_t}{\partial h_t}$:

$$w_t^{NB} h_t = (1-\xi)\left[(1-\alpha)\frac{y_t}{n_t}\right] + \xi\left[\frac{U_t^u - U_t^n}{\lambda_t} + \frac{1-\xi}{\xi}\frac{\omega v_t}{1-n_t}\right] \quad (7)$$

$$\frac{1}{\lambda_t}\frac{\psi_1 \vartheta_t}{(1-h_t)^{\eta}} = (1-\alpha)\frac{y_t}{n_t h_t} \quad (8)$$

Wage Rigidity

- Sudden changes in aggregate wages are not observed in European labour market (Christoffel and Linzert, 2005).
- Following critique of Shimer (2005) puzzle, we introduce wage rigidity in wage setting as in Hall (2005).

$$w_t = \rho_w w_{t-1} + (1-\rho_w) w_t^{NB} \quad (9)$$

where $\rho_w \in (0,1)$ is degree of wage stickiness. w_t is the actual wage while w_t^{NB} is target wage.

Fiscal Authority

The government budget constraint is always balanced and takes the form:

$$g_t = T_t \quad (10)$$

where T_t are total lump sum taxes collected from households. Public spending is exogenous time varying fraction of output:

$$g_t = \left(1 - \frac{1}{\epsilon_{g_t}}\right) y_t \quad (11)$$

Data and Estimation

- Italian quarterly time series data series over 2004Q1-2018Q2 with seven variables : output, consumption, investment, total hours, unemployment, vacancies and real wage.
- Bayesian estimation method to estimate some model's parameters and shocks (See An and Schorfheide, 2007). Agnostic priors for other parameters.

Estimation Findings

Table 1. Prior and Posterior Distribution of Structural and Shocks Parameters

Structural parameters	Symbol	Prior density	Posterior mean	CI
Inverse Frisch elasticity	ι	$\Gamma(1,0.2)$	2.36	[2.08, 2.63]
Bargaining power	ξ	$\beta(0.5,0.2)$	0.79	[0.63, 0.96]
Wage adjustment	ρ_w	$\beta(0.75,0.1)$	0.98	[0.97, 0.99]
Autoregressive parameters				
Technology	ρ_a	$\beta(0.5,0.2)$	0.74	[0.63, 0.85]
Matching	ρ_ς	$\beta(0.5,0.2)$	0.81	[0.68, 0.96]
Fiscal	ρ_g	$\beta(0.5,0.2)$	0.62	[0.48, 0.78]
Bargaining	ρ_ξ	$\beta(0.5,0.2)$	0.23	[0.09, 0.35]
Investment	ρ_i	$\beta(0.5,0.2)$	0.57	[0.42, 0.72]
Preference	ρ_φ	$\beta(0.5,0.2)$	0.61	[0.49, 0.73]
Labour supply	ρ_ϑ	$\beta(0.5,0.2)$	0.90	[0.83, 0.96]
Shocks				
Technology	σ_a	$\Gamma^{-1}(0.01,0.3)$	0.01	[0.008, 0.012]
Matching	σ_ς	$\Gamma^{-1}(0.01,0.3)$	0.04	[0.040, 0.051]
Fiscal	σ_g	$\Gamma^{-1}(0.01,0.3)$	0.01	[0.011, 0.015]
Bargaining	σ_ξ	$\Gamma^{-1}(0.01,0.3)$	0.47	[0.179, 0.732]
Investment	σ_i	$\Gamma^{-1}(0.01,0.3)$	0.75	[0.560, 0.943]
Preference	σ_ϖ	$\Gamma^{-1}(0.01,0.3)$	0.01	[0.008, 0.017]
Labour supply	σ_ϑ	$\Gamma^{-1}(0.01,0.3)$	0.005	[0.004, 0.006]

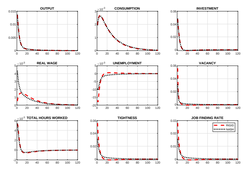
Variance Decomposition

Table 2. Variance Decomposition

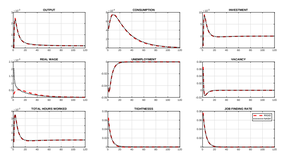
	Technology	Matching	Fiscal	Bargaining	IST	Labour Supply	Preference
Output	23	2	0	2	57	2	14
Consumption	2	0	0	0	86	0	11
Investment	13	1	0	0	47	1	40
Real Wage	2	1	0	31	64	2	1
Unemployment	3	17	0	18	59	2	3
Vacancies	5	4	0	19	68	2	3
Total Hours	7	5	0	5	47	4	33

Impulse Response Analysis

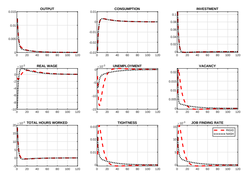
(a) Technology Shock



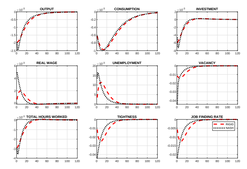
(b) Matching Shock



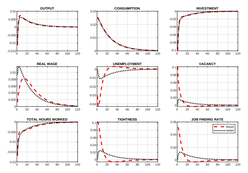
(c) Preference Shock



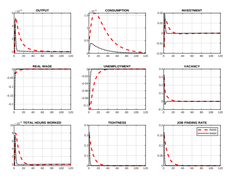
(d) Labour Supply Shock



(e) Investment Technology

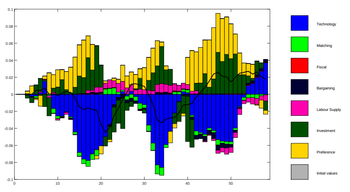


(f) Bargaining Shock

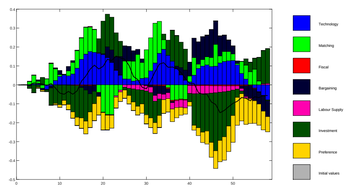


Historical Decomposition

(a) Output



(b) Unemployment



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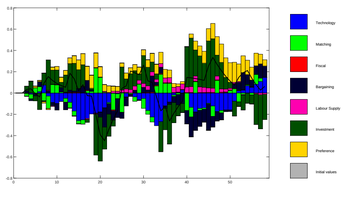
(c) Vacancies



Conclusion

- All parameters are identified, statistically significant and in line with values observed in literature .
- Wage rigidity fits data well, significantly influences propagation of shocks and has amplifying effects on labour market dynamics.
- Neutral and investment technology shocks are two important drivers in output fluctuations.
- Matching shock has sizable contribution in explaining variability in unemployment and vacancy rates but does not affect output fluctuations.

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