Mismatch shocks and unemployment during the Great Recession

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Why is unemployment so high since 2008?

- Kocherlakota (2010): Unemployment is high because of **structural** factors
  - **mismatch**
- Bernanke (2010): Unemployment is high because of **cyclical** factors
  - **weak aggregate demand**

What we do

Quantify the importance of **structural factors** in unemployment dynamics by using an estimated DSGE model

and

Study how the **natural rate of unemployment** has evolved during the Great Recession

What we do

1. Take a standard medium scale NK model with unemployment (Gertler, Sala and Trigari, 2008)
2. Introduce a **shock to the matching efficiency** to capture structural factors

$$M_t = \varsigma_t S_t^{\sigma} V_t^{1-\sigma}$$

3. Introduce **generalized hiring cost function** (Yashiv, 2000)

$$Cost_t = \frac{\kappa}{2}\left(\frac{\phi_V V_t + (1-\phi_V) M_t}{N_t}\right)^2$$

4. Estimate the model treating **matching efficiency as observable**
5. Measure impact of matching efficiency shocks on **unemployment and on the unemployment gap**

What we find

- Negative mismatch shocks during the Great Recession
  - raised unemployment by 1.25 percentage points
  - raised the natural rate of unemployment by 2 percentage points
- Small but non negligible effects with policy implications

Shocks to the matching efficiency: interpretation

- Matching efficiency shocks in Andolfatto (1996)

$$M_t = \varsigma_t S_t^{\sigma} V_t^{1-\sigma}$$

$$\ln \zeta_t = \rho_{\zeta} \ln \zeta_{t-1} + \epsilon_{\zeta t}$$

- Interpreted as a **reallocation shock** (Lilien, 1982, and Abraham and Katz, 1986)
  - Increase in skill and geographical mismatch
  - Reduction search intensity by workers and firms
  - Shifts in composition of the unemployment pool
  - Fluctuations in participation

Shocks to the matching efficiency: refinements

- It s the Solow residual of the matching function:

$$\begin{aligned} M_t &= \varsigma_t S_t^{\sigma} V_t^{1-\sigma} \\ Y_t &= A_t K_t^{\alpha} N_t^{1-\alpha} \end{aligned}$$

- How to purify it? (Basu, Fernald and Kimball, 2006)
- It is a **catch-all shock** for structural factors...
- ...but it has an **empirical counterpart** (Chari, Kehoe, McGrattan, 2009)

The model: basic ingredients

- New Keynesian model with nominal rigidities and real rigidities, as in Christiano, Eichenbaum and Evans (2005), and search and matching frictions (similar to Gertler, Sala and Trigari, 2008)
- Household problem is standard with perfect consumption insurance
- A continuum of monopolistically competitive intermediate goods-producing firms
- A representative finished goods-producing firm
- A central bank: Taylor rule
- A fiscal authority: budget balanced

The model: shocks and frictions

- Search and matching frictions in labor market
- Sticky prices and wages (Rotemberg, 1982; Arsenau and Chugh, 2008)
- Habit in consumption; Investment adjustment costs; Variable capital utilization
- 8 shocks:
  - Technology, Investment-specific
  - Fiscal, Monetary
  - Markup, Bargaining power
  - **Matching efficiency, Risk premium**

The model: intermediate good producing firm

$$E_t \sum_{s=0}^{\infty} \beta^s \Lambda_{t+s} \left(\frac{D_{i,t+s}}{P_{t+s}} \right)$$

where

$$D_{i,t} = P_{it} Y_{it} - W_{it} N_{it} - r_t^K K_{it} - ADJ_t P_t Y_t$$

subject to

$$\begin{aligned} Y_{it} &\leq K_{it}^{\alpha} \left(A_t N_{it} \right)^{1-\alpha} \\ Y_{it} &= \left(\frac{P_{it}}{P_t} \right)^{-\theta_t} Y_t \\ N_{it} &= (1-\rho) N_{it-1} + M_{it} \end{aligned}$$

where $M_{it} = q_t V_{it}$, $S_t = 1 - (1-\rho) N_{t-1}$ and $U_t = 1 - N_t$

The model: important distinction

- Post-match hiring costs (training cost), as in Gertler and Trigari (2008) and Pissarides (2009):

$$Cost_t^{post} = \frac{\phi_N}{2}\left(\frac{M_{it}}{N_{it}}\right)^2$$

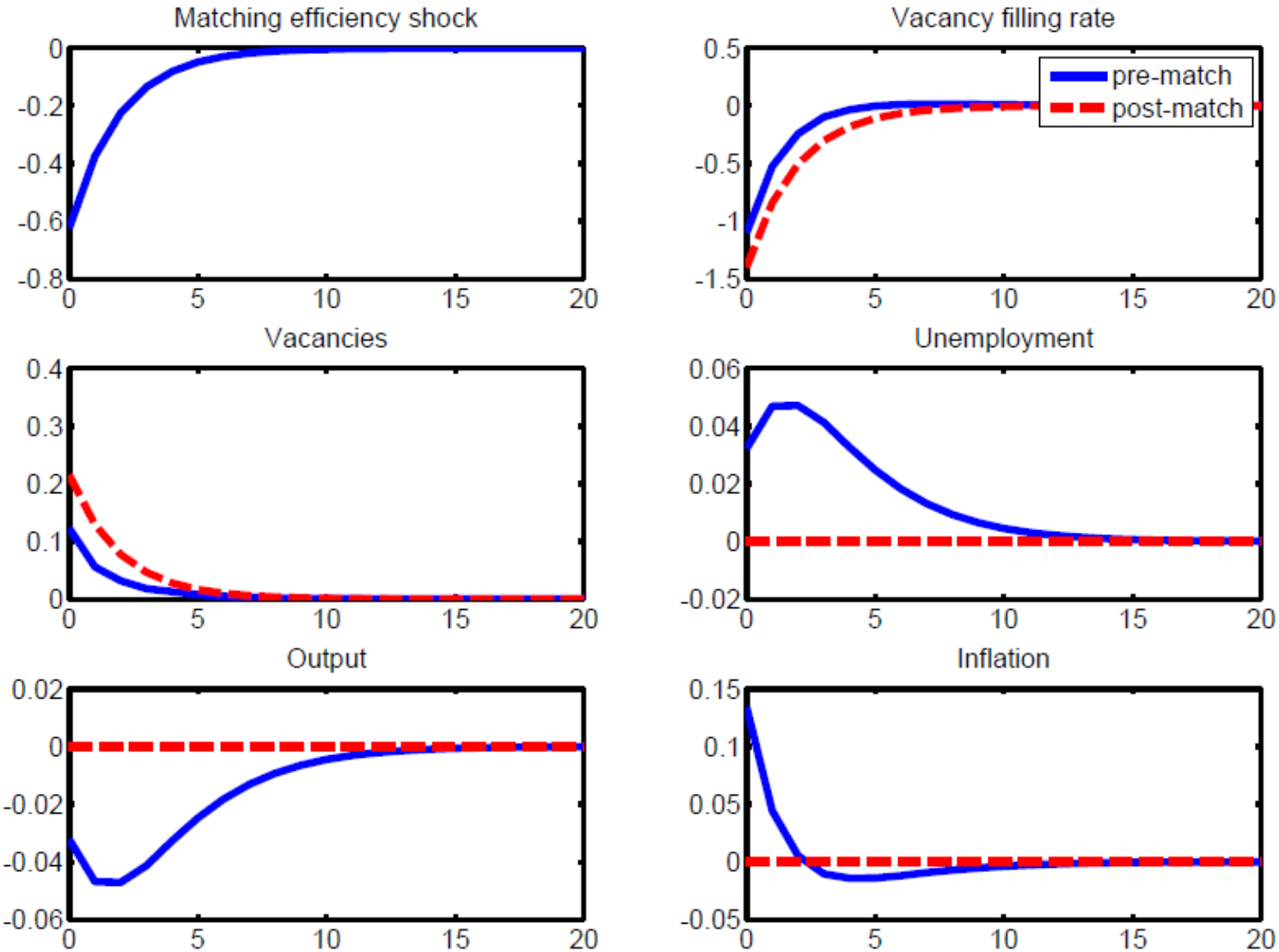
- Pre-match hiring costs (linear cost of posting a vacancy), as in Pissarides (2000):

$$Cost_t^{pre} = \phi_V V_{it}$$

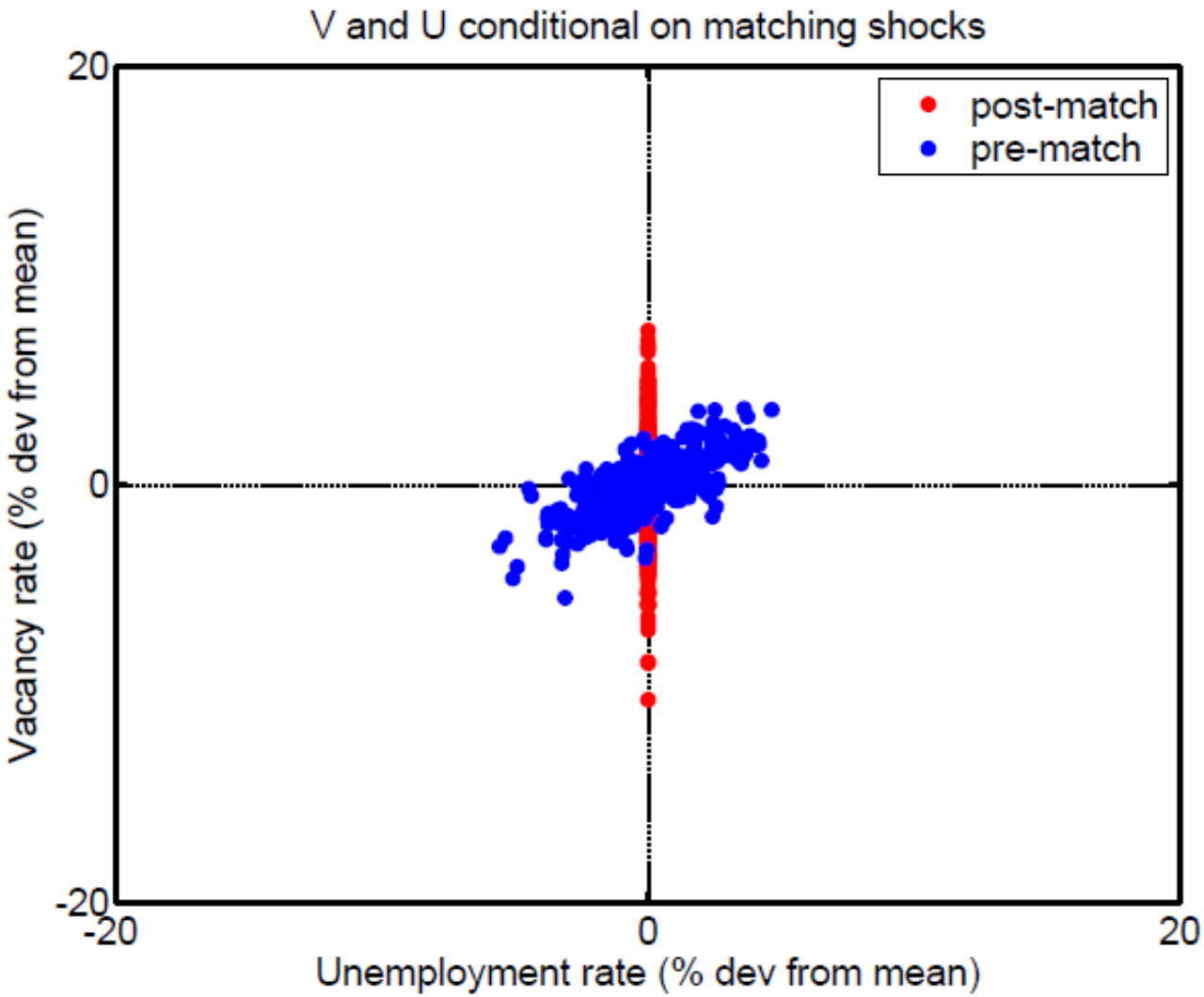
- Here: hybrid form, as in Yashiv (2000):

$$Cost_{ti} = \frac{\kappa}{2}\left(\frac{\phi_V V_{ti} + (1-\phi_V) M_{ti}}{N_{ti}}\right)^2$$

The model: important distinction (from Furlanetto, Groshenny, 2012a)



Model: important distinction (from Furlanetto, Groshenny, 2012a)



Econometric strategy

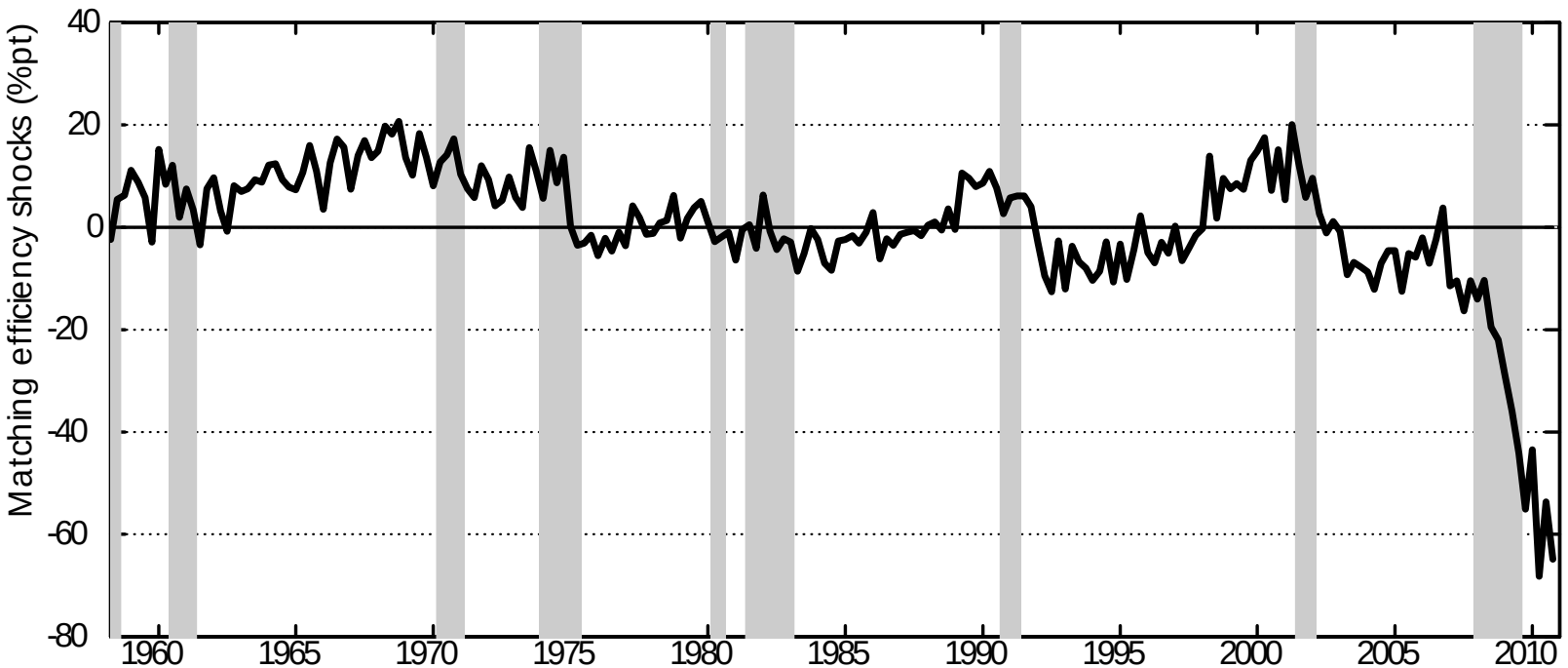
- Log-linearize model around steady state
- Calibrate 14 parameters
- Estimate 26 parameters with Bayesian techniques
- Quarterly data on 8 macro variables

$$\ln \frac{y_t}{y_{t-1}}, \ \ln \frac{c_t}{c_{t-1}}, \ \ln \frac{i_t}{i_{t-1}}, \ \ln \frac{w_t}{w_{t-1}}, \ \ln U_t, \quad \ln \frac{P_t}{P_{t-1}}, \ \ln R_t, \ln \zeta_t$$

- Sample period: 1957: Q1-2010:Q3

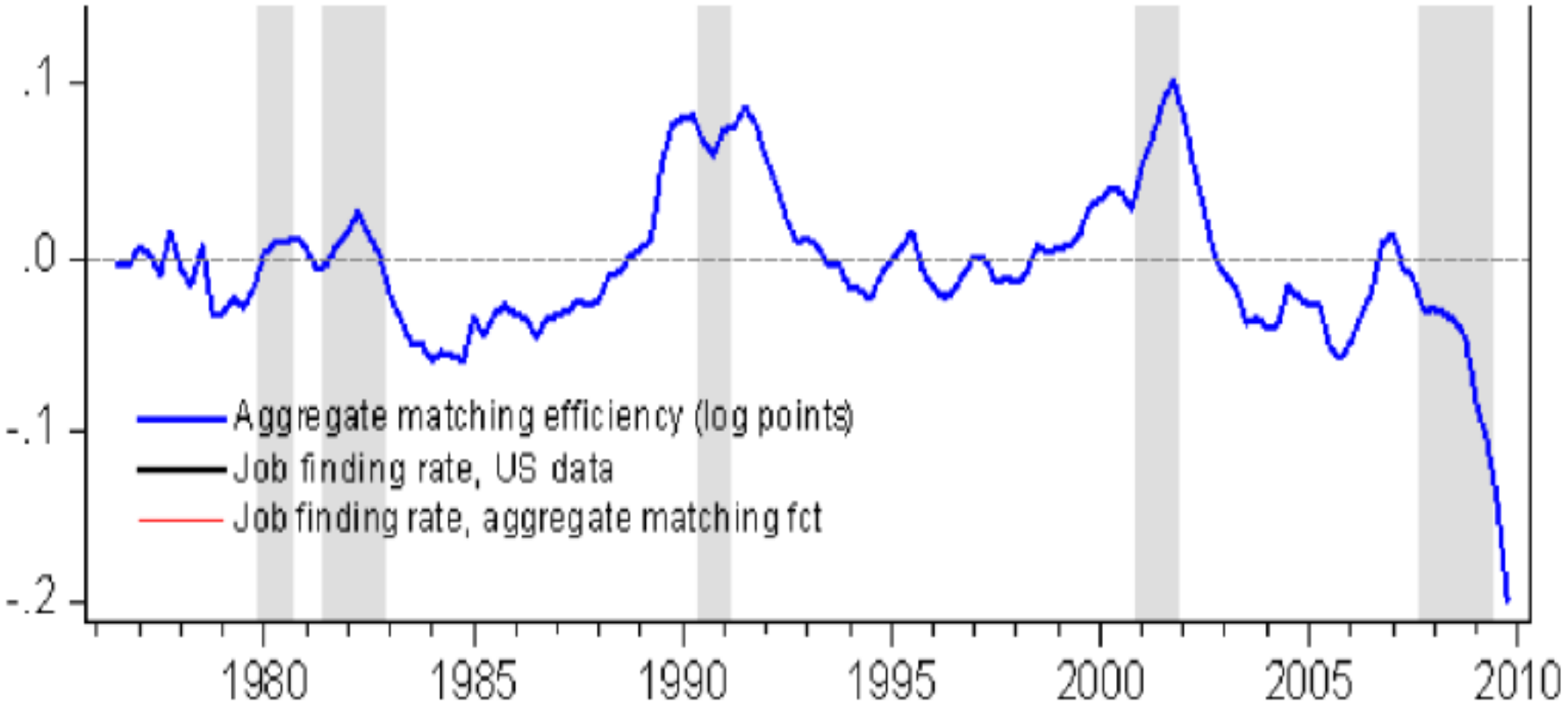
Econometric strategy: matching efficiency shocks as an observable

$$\begin{cases} \widehat{V}_t = \widehat{\Theta}_t - \rho \frac{1-U}{U} \widehat{s}_t - \left(1 - \rho - \rho \frac{1-\rho(1-U)}{1-(1-\rho)(1-U)}\right) \frac{1-U}{U} \widehat{N}_{t-1} \\ \widehat{\zeta}_t = \widehat{s}_t - (1-\sigma)\left(\widehat{V}_t + \frac{1-\rho(1-U)}{1-(1-\rho)(1-U)} \widehat{N}_{t-1}\right) \\ \widehat{N}_t = \frac{U}{1-U} \widehat{\Theta}_t - \frac{U}{1-U} \widehat{V}_t \end{cases}$$



Econometric strategy: matching efficiency shocks as an observable

Estimated series from Barnichon and Figura (2012)

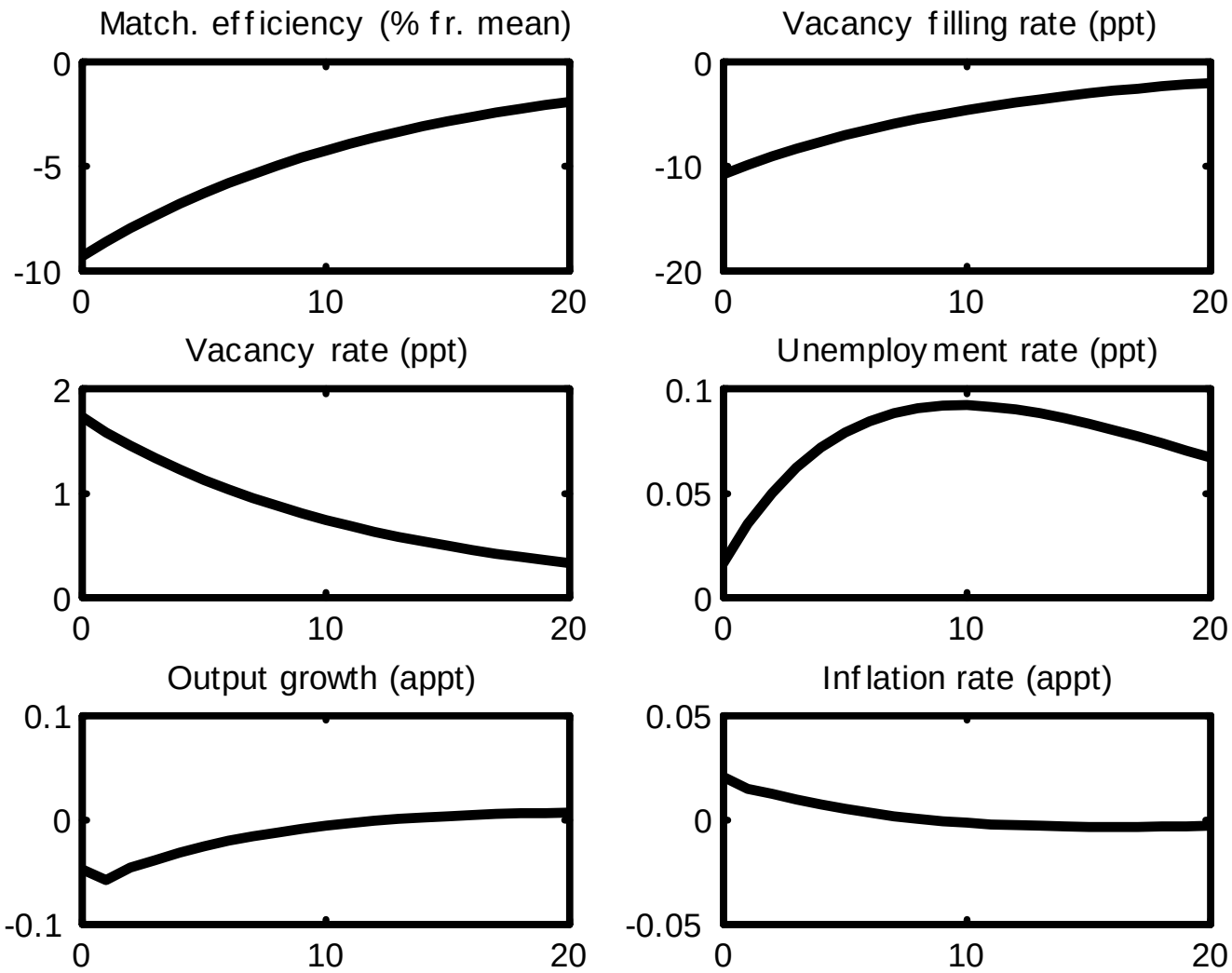


Results: estimated parameters

		Priors	5%	Post Med	95%
Hiring cost par.	ϕ_V	**Beta (0.5,0.25)**	**0.01**	**0.04**	**0.09**

- Dominant role for post-match hiring costs
- Macro evidence: Christiano, Trabandt and Walentin (2011)
- Micro-evidence: Silva and Toledo (2009) and Yashiv (2000)
- Implications

Results: mismatch shocks' propagation

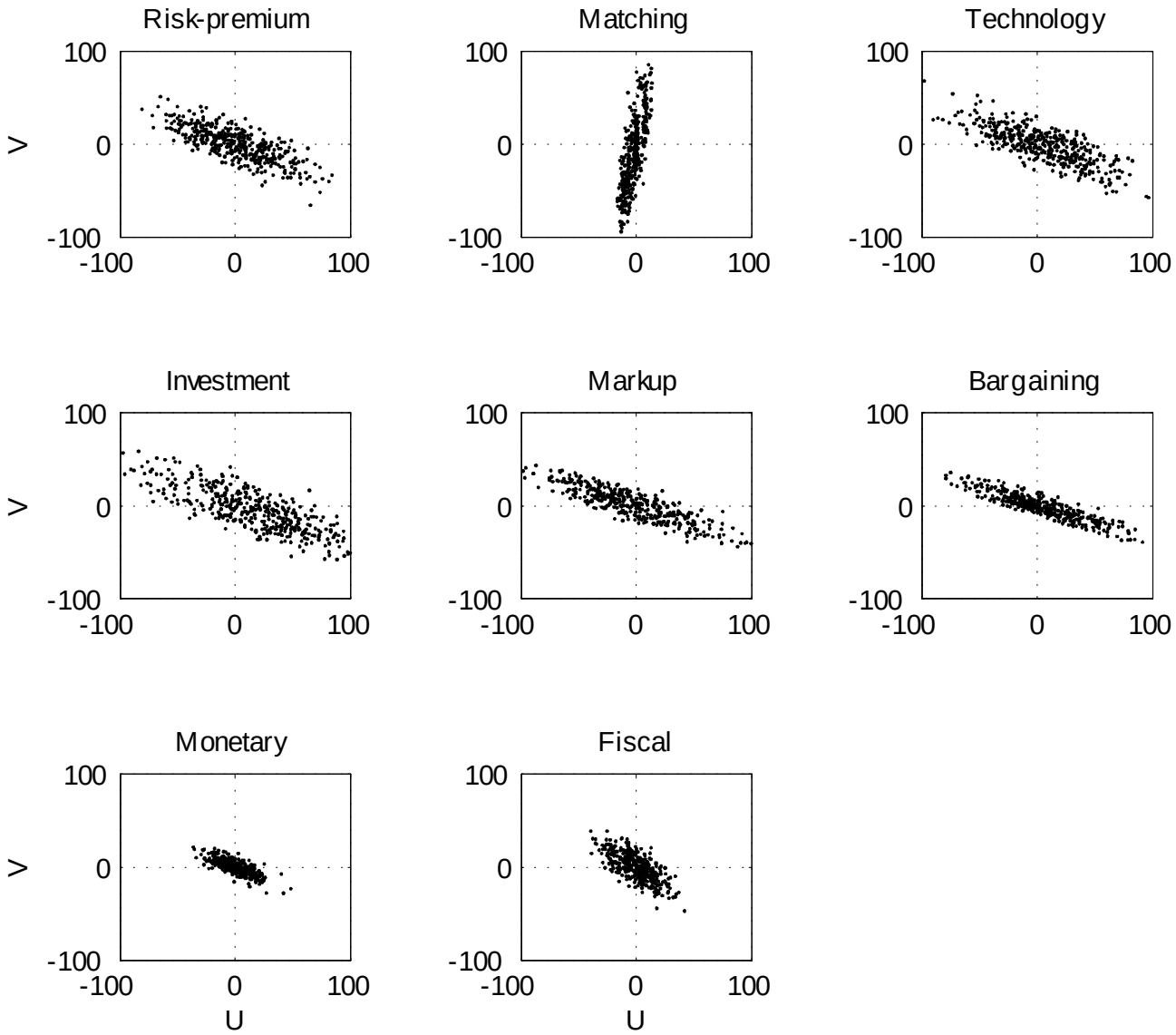


Results: variance decomposition

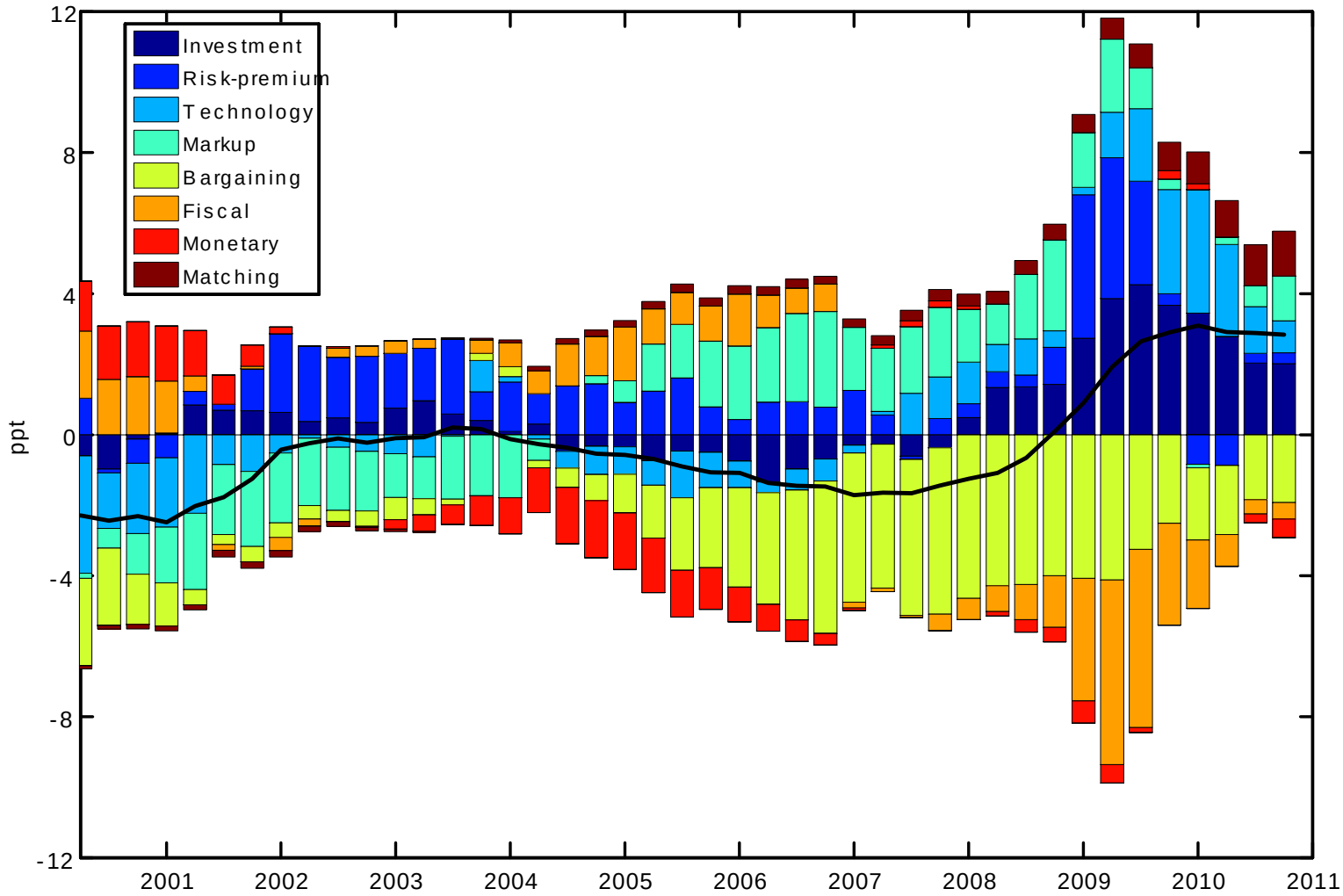
Table 5: Variance decomposition (in %)

	Output	Unemp.	Vacancy	Inflation
Technology	**30**	18	11	16
Monetary	**3**	2	2	2
Investment	**27**	31	20	57
Matching	**0**	**0.2**	**38**	**0**
Risk-premium	**14**	9	8	15
Markup	9	26	12	6
Bargaining	**3**	12	5	2
Fiscal	**14**	2	5	2

Results: mismatch shocks, vacancies and unemployment



Results: historical decomposition



Results: historical decomposition

- Mismatch shocks raised unemployment by 1.25 percentage points during the Great Recession
- Consistent with Sahin, Song, Topa and Violante (2012)
- Consistent with Barnichon and Figura (2012)

Results: model based natural rate of unemployment

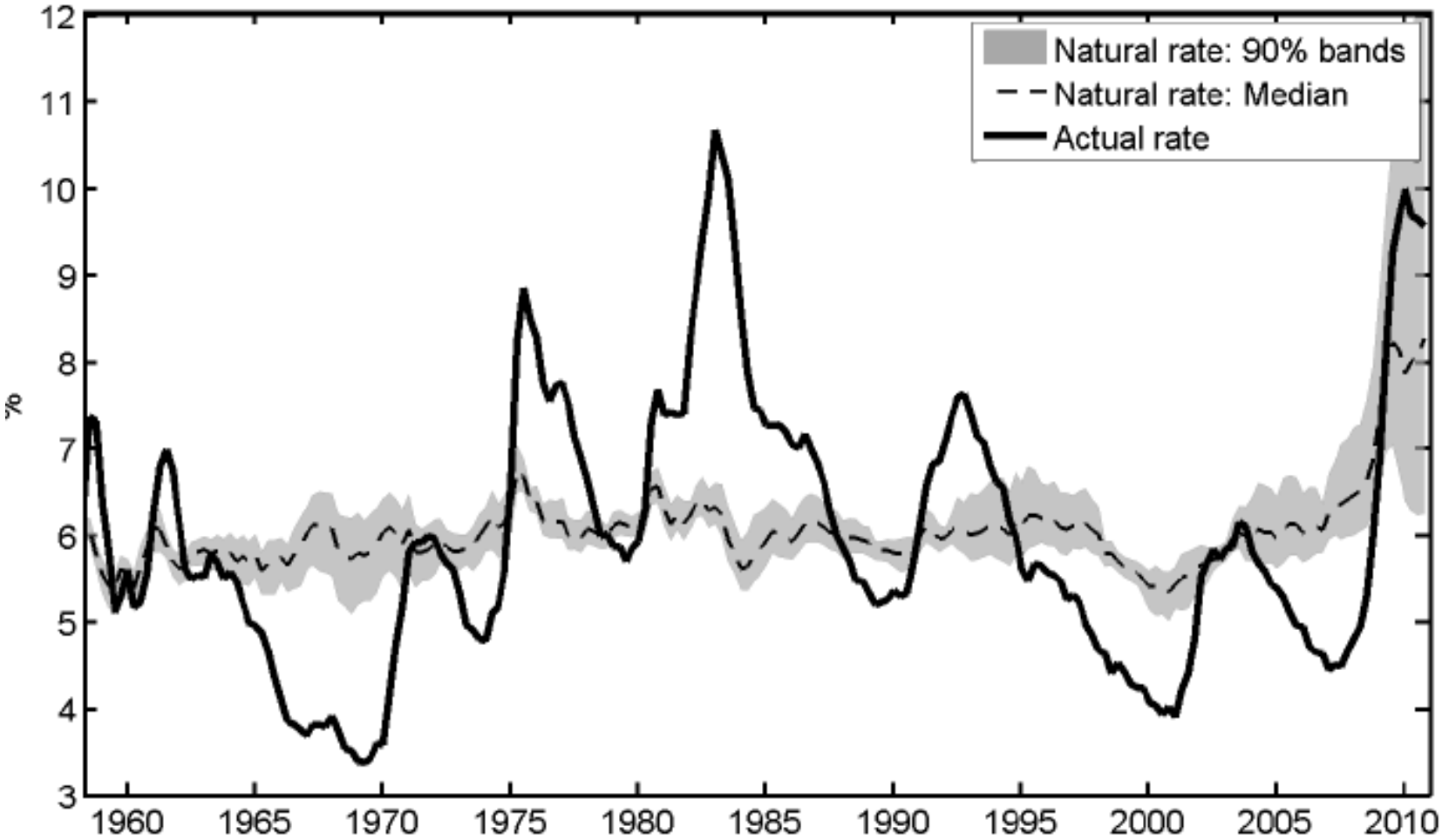
- We define the natural rate as Smets and Wouters (2007), Sala, Söderström and Trigari (2008)
- Counterfactual rate of unemployment that emerges when
  - Flexible prices and wages
  - Constant mark-up and bargaining power
- Debate in the literature

The unemployment gap?

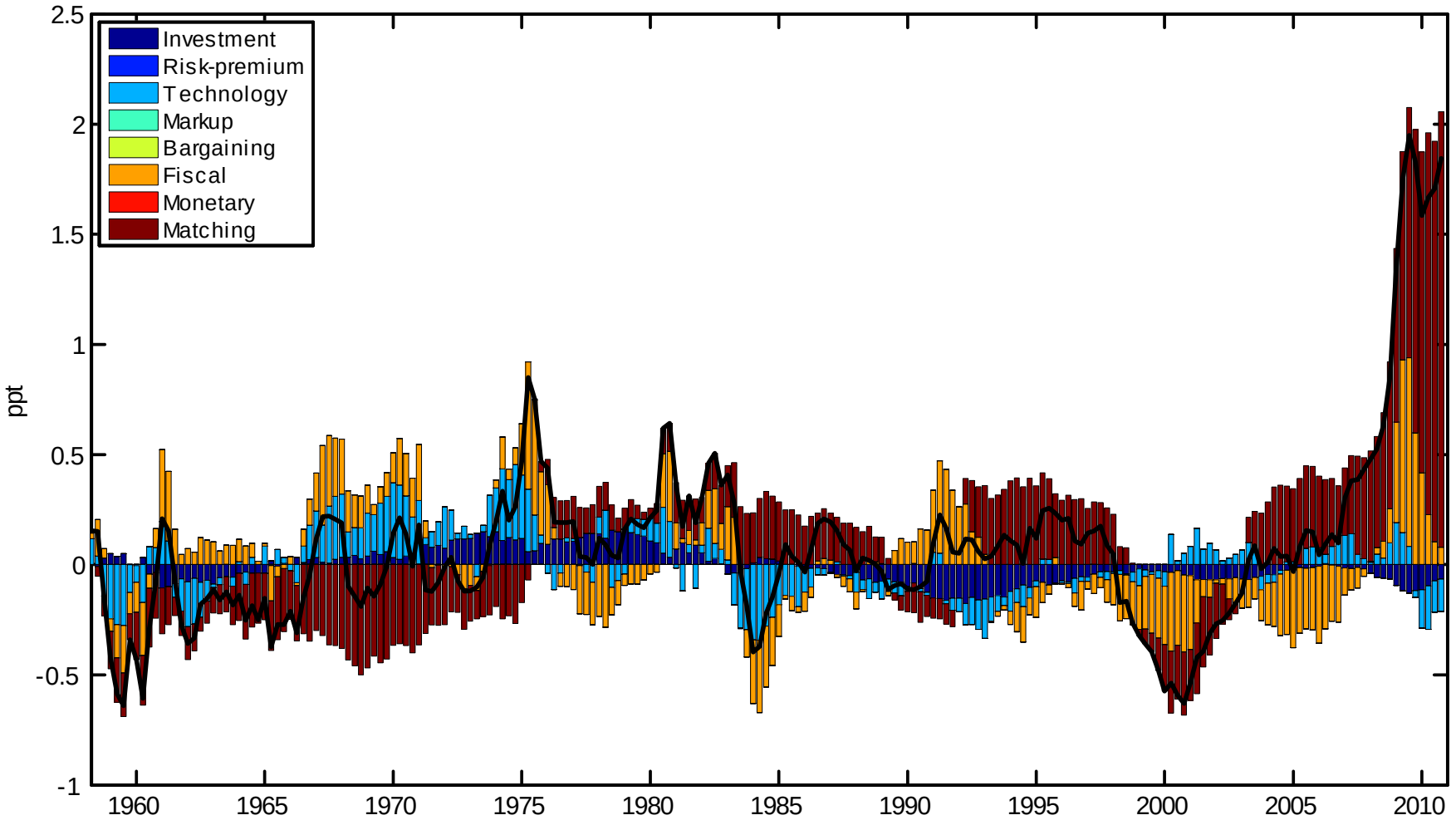
"The primary role for monetary policy is to offset the impact of nominal rigidities — that is, the sluggish adjustment of prices and inflation expectations to shocks. To offset nominal rigidities, monetary policy accommodation should track the gap between the observed unemployment rate u and the natural rate u^*. The challenge for monetary policymakers is that u^* changes over time and is unobservable

Narayana Kocherlakota, March 2011

Results: model based natural rate of unemployment



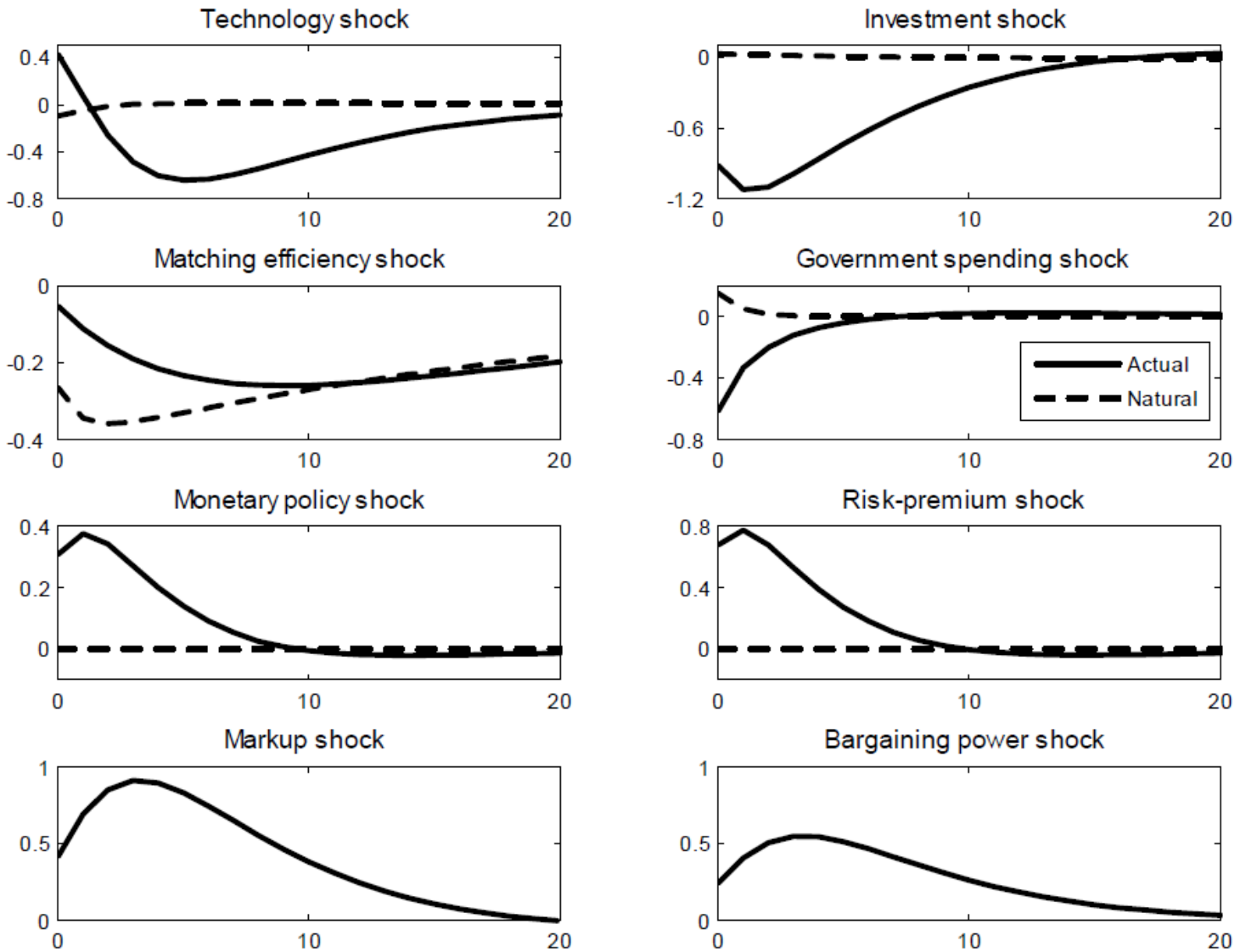
Results: historical decomposition



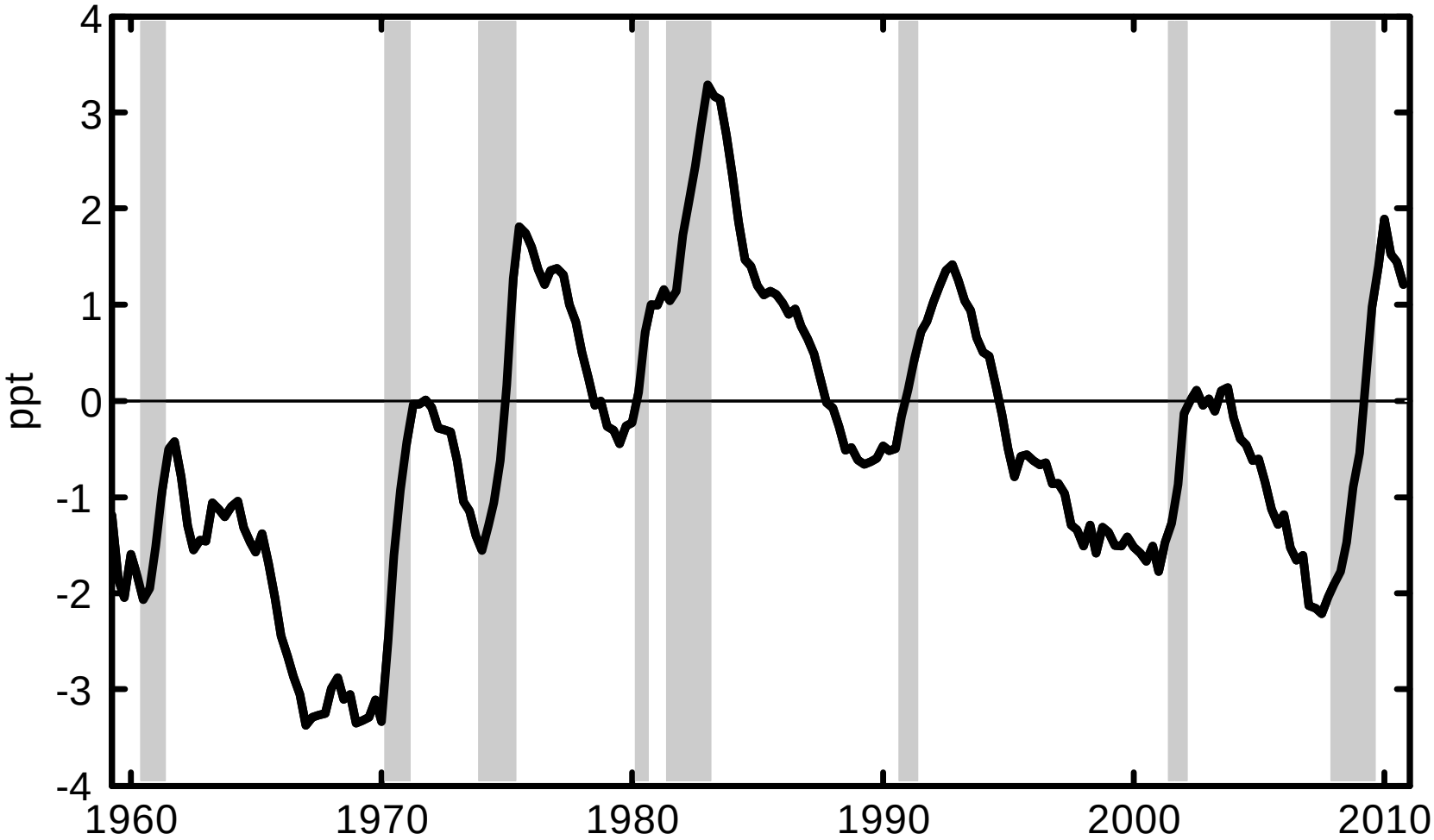
Why matching efficiency shocks (and search frictions) play a role?

- They can explain some patterns in the data (positive correlation between unemployment and vacancies)
- They are the dominant driver of the natural rate
  - Only shock that propagates more in a RBC version of the model

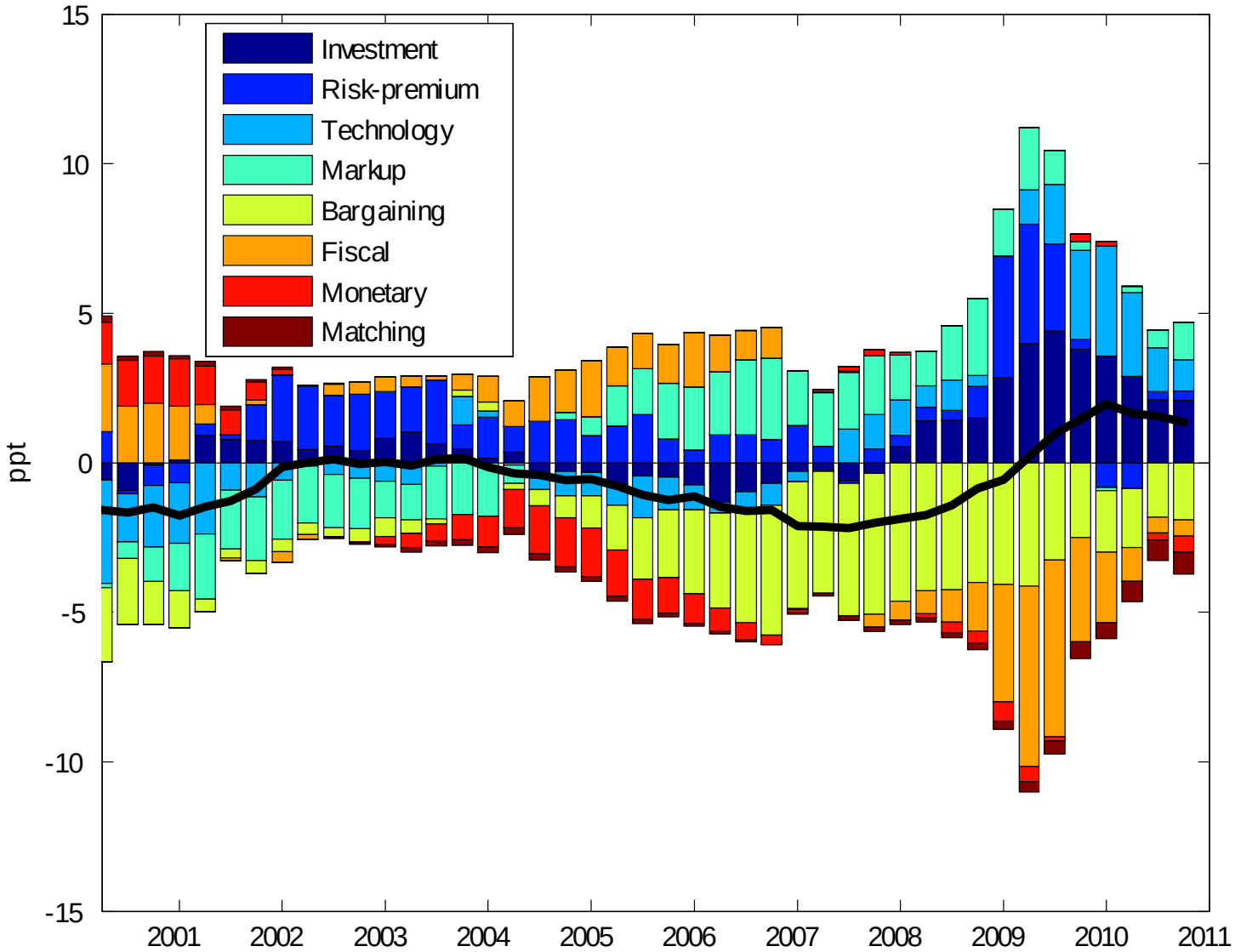
Why is the natural rate driven by mismatch shock?



Results: unemployment gap



Results: unemployment gap historical decomposition



Conclusion

- Matching efficiency shocks play a **small** but non negligible role, although we find a dominant role for the post-match component
  - raised unemployment by 1.25 percentage points
  - raised the natural rate of unemployment by 2 percentage points
- We contribute to the debate on whether the model with search and matching frictions is a good model for unemployment
  - Christiano, Eichenbaum and Trabandt (2012)
  - Michaillat (2012)

		Priors	5%	Post Med	95%
Hiring cost par.	ϕ_V	**Beta (0.5,0.25)**	**0.01**	**0.04**	**0.09**
Habit in consump.	h	Beta (0.7,0.1)	0.60	0.65	0.69
Invest. adj. cost	ϕ_I	IGamma (5,1)	2.89	3.48	4.24
Capital ut. cost	ϕ_{u2}	IGamma (0.5,0.1)	0.44	0.59	0.82
Price adjust. cost	ϕ_P	IGamma (50,20)	45.62	58.72	76.04
Wage adjust. cost	ϕ_W	IGamma (50,20)	130.32	207.98	307.31
Wage indexation	ϱ	Beta (0.5,0.2)	0.87	0.94	0.98
Interest smoothing	ρ_r	Beta (0.7,0.1)	0.44	0.60	0.69
Resp. to inflation	ρ_π	IGamma (1.5,0.2)	1.57	1.70	1.88
Resp. to growth	ρ_y	IGamma (0.5,0.1)	0.39	0.48	0.58