Time-varying wage Phillips curves in the euro area with a new measure for labor market slack

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CPB Workshop, 6 April 2018

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The Phillips curve (not) at work

- The wage Phillips curve relates wage inflation, w_t, to slack, s_t:

$$w_t = \gamma s_t \tag{1}$$

- Often used to forecast (wage) inflation
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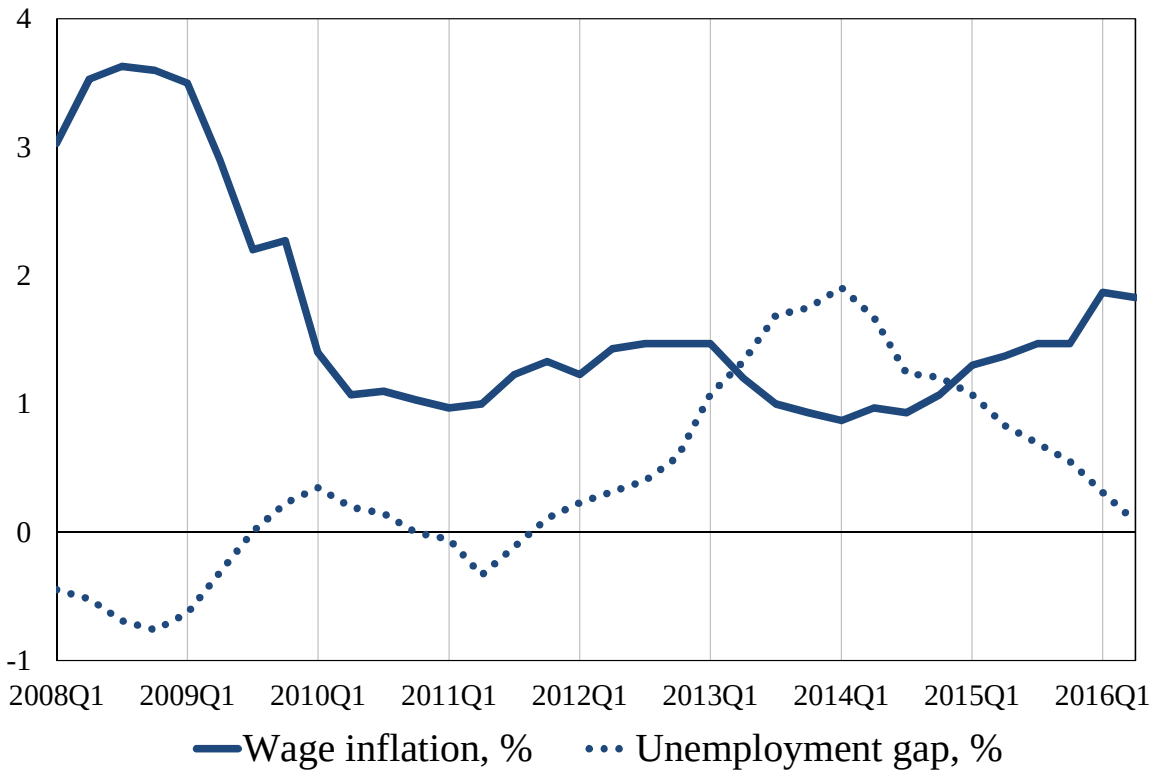
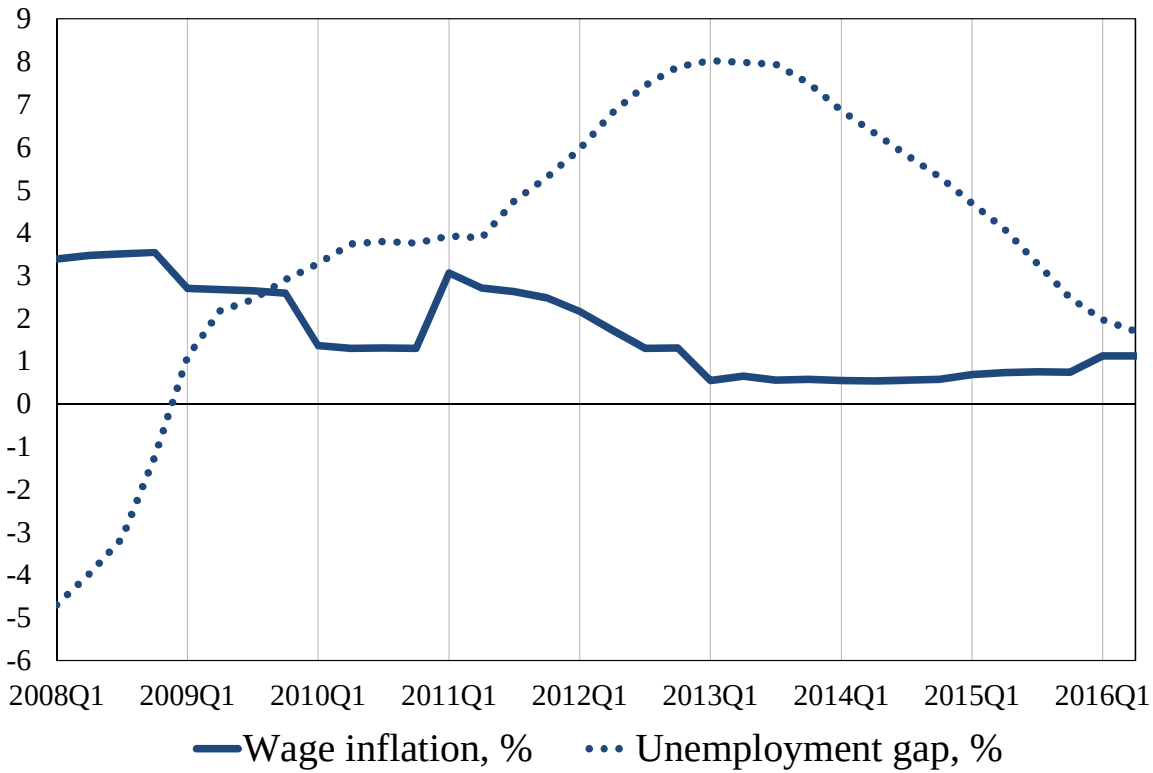
- Puzzle: missing wage inflation

Missing wage inflation puzzle in the Netherlands (?)



Note: Wage inflation given by year on year growth rate of negotiated wages. *Source*: European Central Bank (wages) and European Commission (unemployment gap).

Missing wage inflation puzzle in Spain



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Some possible explanations for the wage inflation puzzle

$$w_t = \gamma s_t$$

1. The Phillips curve slope, γ, has changed
2. We are not using the correct measure for slack, s_t
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- **This paper: consider options 1 and 2**

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  - Allows us to identify heterogeneities across countries

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  - Benchmark specification indicates a *flattening* Phillips curve (except for Spain)
  - Alternative specification indicates a *steepening* Philips curve (except for Germany)

An alternative measure for slack: The labor shortage indicator

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  - Part-timers that want to work more hours
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- Natural rate of unemployment unobserved:
  - Must be estimated, subject to estimation bias
  - Great uncertainty about the type of model used for estimation (e.g. static vs. rational expectations)
  - $\Rightarrow$ bias also large after a crisis, due to incorrect assessment of labor market adjustment process

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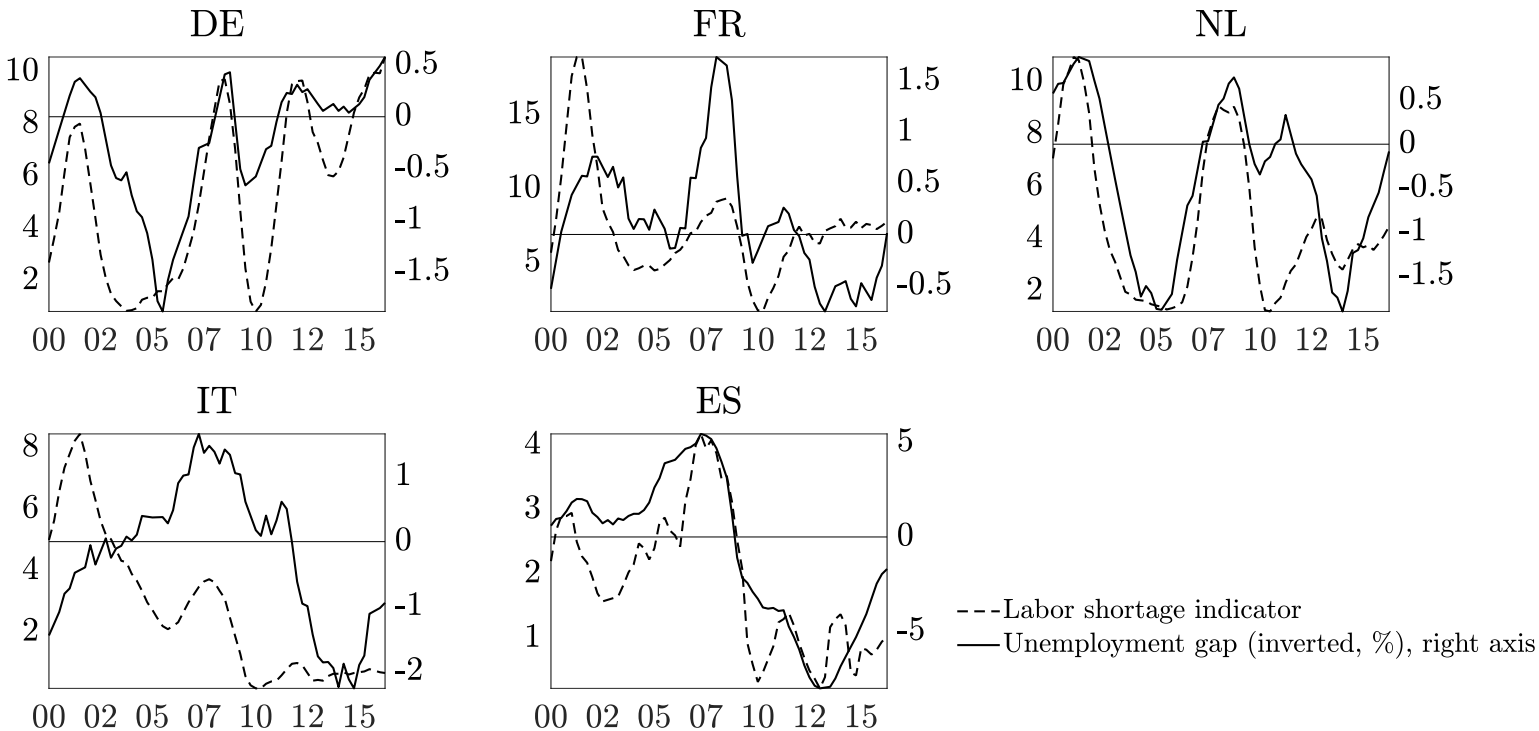
- Quarterly data available since 1985Q1, covers all EA countries

Two stories about labor market conditions

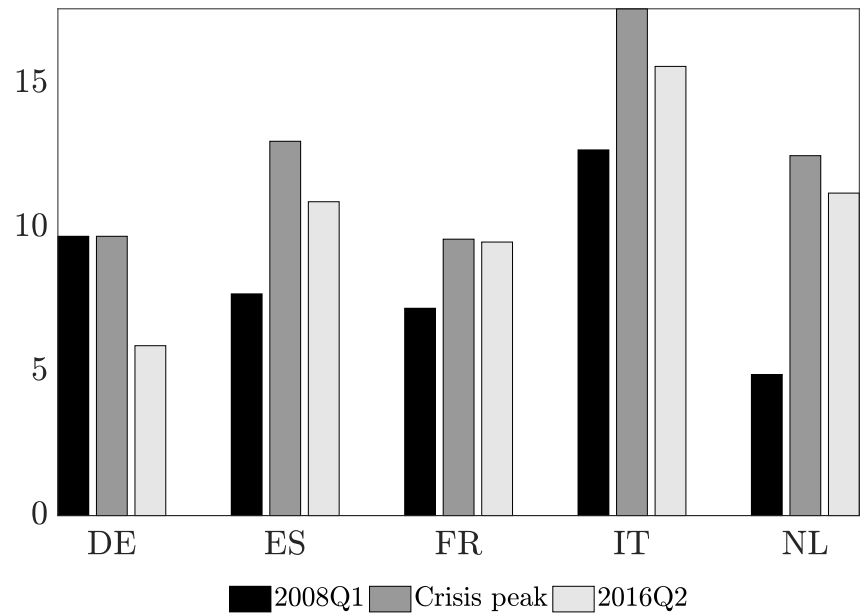
The (inverted) unemployment gap vs the labor shortage indicator



Source: European Commission.

Indications of a slow labor market recovery

Underemployment (% of active population)



Note: The level of underemployment is calculated as the sum of underemployed part-time workers, persons seeking work but not immediately available and persons available to work but not seeking. The crisis peak refers to 2008Q2 for Germany, 2015Q3 for France, 2013Q3 for the Netherlands, 2015Q1 for Italy and 2013Q2 for Spain. *Source*: European Commission.

Estimation strategy

An augmented wage Phillips curve

- We estimate the following wage Phillips curve:

$$w_t = \omega + \rho w_{t-1} + \gamma s_t + \alpha \pi_t^e + e_t$$

  where:

  - w_t wage inflation
  - ω long-run wage inflation or labor productivity
  - w_{t-1} lagged wage inflation, to capture persistence
  - s_t a measure for slack
  - π_t^e expected inflation, to capture forward-looking behavior
  - e_t residual

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Allowing for time variation

- We allow for time variation in ω, ρ, γ and α:

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- State-space model to be estimated:

$$w_t = x_t \beta_t^{'} + e_t, \qquad e_t \sim \mathcal{N}(0, R) \tag{3}$$

$$\beta_t = \beta_{t-1} + v_t, \qquad v_t \sim \mathcal{N}(0, Q) \tag{4}$$

$$\text{cov}(e_t, v_t) = 0$$

with $x_t \equiv [1, w_{t-1}, s_t, \pi_t^e]'$ and $\beta_t \equiv [\omega_t, \rho_t, \gamma_t, \alpha_t]'$

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- We estimate (3)-(4) using Bayesian methods

Prior beliefs

- β_0, R_0 and Q_0 initialized using training sample of $T_0 = 10$ quarters
- Prior distribution for R is $R \sim \mathcal{IG}\left(T_0/2, D_0/2\right)$, with $D_0 = 0.1$
- Prior distribution for Q is $Q \sim \mathcal{IW}\left(Q_0, T_0\right)$, with $Q_0 = R_0 \left(x_{0,t}' x_{0,t}\right)^{-1} \times T_0 \times \tau$ and $\tau = 0.35$
- Gibbs sampling involves 12,000 draws, 10,000 are discarded

Details on the data used

- Wage inflation = y-o-y growth rate of negotiated wages from ECB
- Unemployment gap and labor shortage indicator from EC
- Inflation expectations = 1-year ahead from Consensus Forecasts
- Sample: 1999Q1 to 2016Q2, deliberately excluding pre-EA period
- Coverage: DE, FR, IT, ES and NL (80% of EA GDP)

Estimation results

Constant parameters, s_t = unemployment gap

Wage growth, w_t	DE	FR	IT	NL	ES
Constant, ω	1.152***	0.041	0.039	-0.02	0.345
	(0.414)	(0.113)	(0.306)	(0.17)	(0.215)
Lagged wage growth, w_{t-1}	0.511***	0.818***	0.771***	0.808***	0.731***
	(0.098)	(0.044)	(0.088)	(0.044)	(0.069)
Unemployment gap, s_t	-0.421***	-0.1***	-0.06	-0.134**	-0.044**
	(0.118)	(0.033)	(0.067)	(0.06)	(0.018)
Inflation expectations, π_t^e	-0.035	0.227***	0.259**	0.253***	0.146
	(0.179)	(0.08)	(0.126)	(0.073)	(0.107)
Adjusted R^2	0.542	0.945	0.779	0.938	0.898
Number of observations	69	69	69	69	69

Notes: Standard errors in parentheses; ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively. Estimation performed using OLS.

Constant parameters, s_t = labor shortage indicator

Wage growth, w_t	DE	FR	IT	NL	ES
Constant, ω	0.758*	-0.282***	-0.152	-0.224**	-0.055
	(0.384)	(0.089)	(0.196)	(0.108)	(0.123)
Lagged wage growth, w_{t-1}	0.566***	0.856***	0.821***	0.792***	0.749***
	(0.096)	(0.04)	(0.066)	(0.04)	(0.069)
Labor shortage indicator, s_t	0.068***	0.014***	0.018	0.061***	0.115**
	(0.023)	(0.004)	(0.021)	(0.017)	(0.056)
Inflation expectations, π_t^e	-0.151	0.33***	0.27**	0.204***	0.197*
	(0.199)	(0.077)	(0.123)	(0.071)	(0.101)
Adjusted R^2	0.519	0.946	0.779	0.944	0.895
Number of observations	69	69	69	69	69

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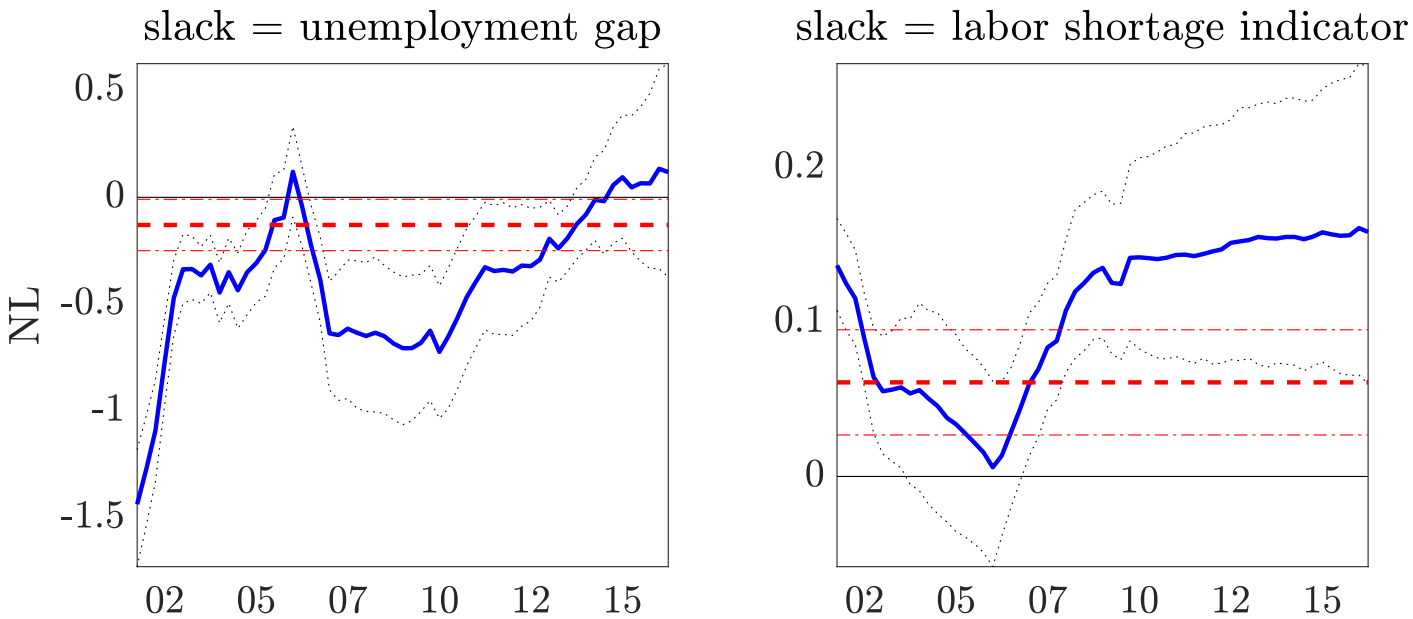
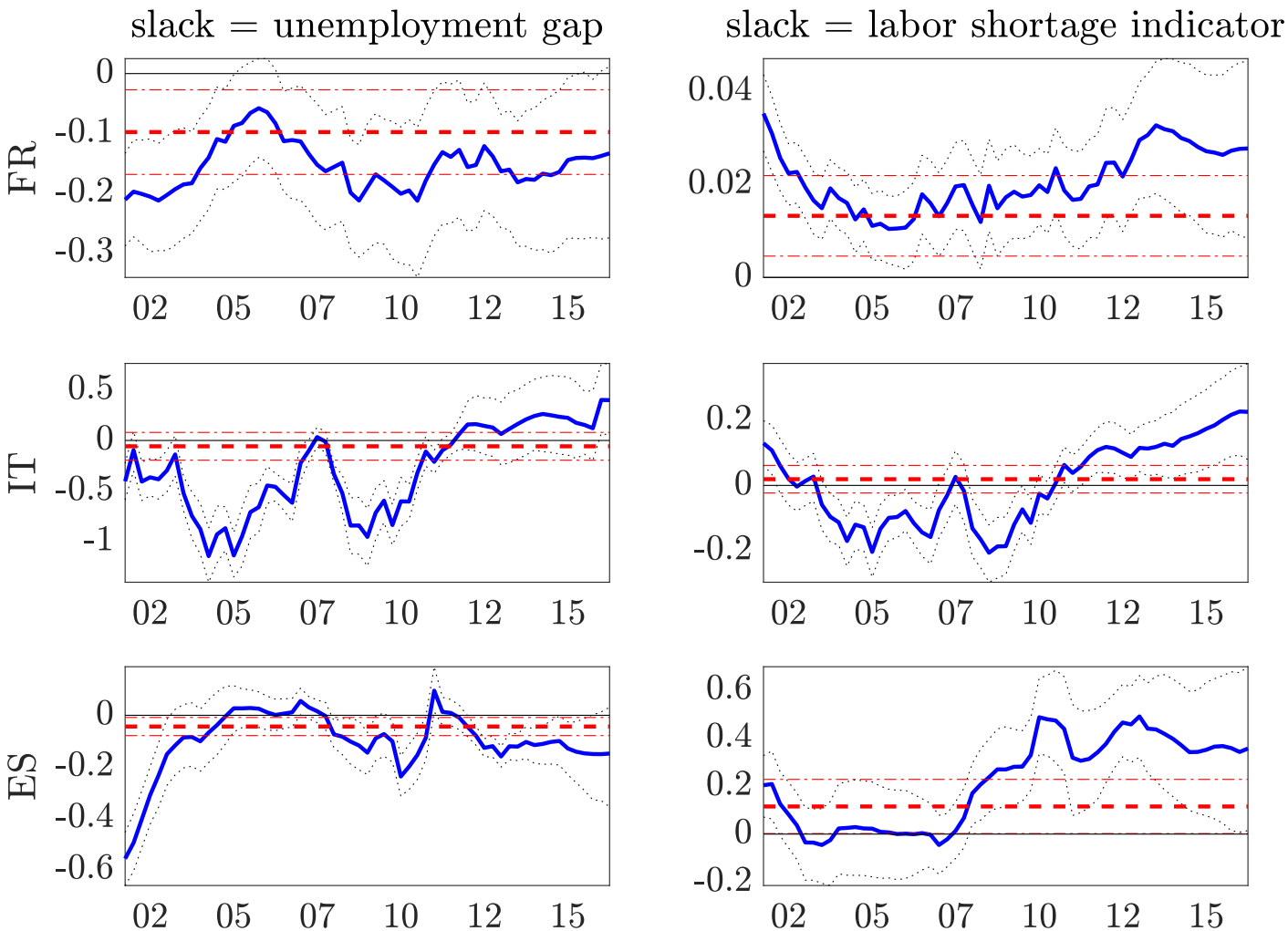
Time-varying Phillips curve slope, γ_t, Netherlands



Notes: Blue solid (dotted) lines = 50th (16th and 84th) percentiles from the posterior distribution. Red horizontal dashed (dashed-dotted) lines = constant parameter estimates (95% interval).

Time-varying Phillips curve slope, γ_t, FR, IT and ES



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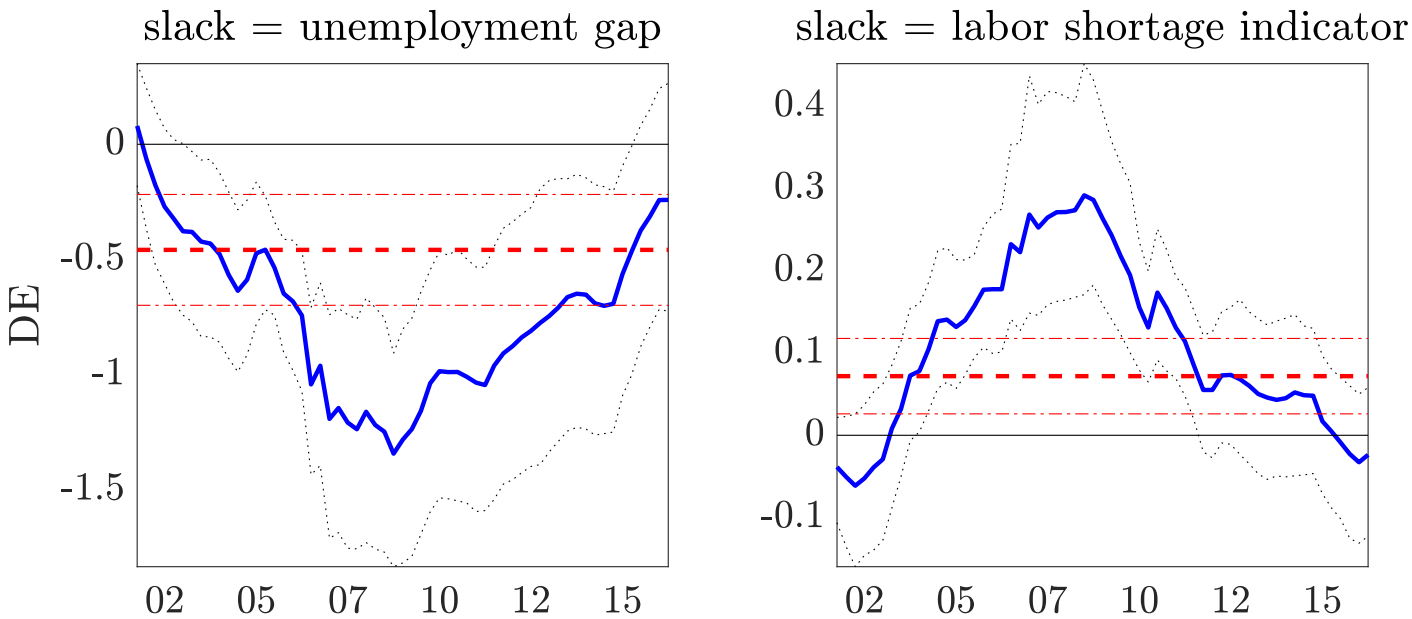

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- Similar results for Italy, France and Spain
- Germany: both specifications indicate *flatter* Phillips curve

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- Contributions:
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- Main results:
  - Phillips curve alive and well in NL, IT, FR and ES
    $\Rightarrow$ provided appropriate slack measure is used
  - In Germany, wage Phillips curve flattened