Downward Wage Rigidity in Europe

A New Flexible Parametric Approach and Empirical Results

Andreas Behr & Ulrich Pötter

Institute for Econometrics
University of Münster
Faculty of Social Science
University of Bochum

EPUNET Presentation, Barcelona 2006

Gliederung

Downward Nominal Wage Rigidity (DNWR)

Some empirical facts

- High unemployment in Europe
- Low inflation
- Inflexible labour markets
- Controversial discussion about extent and relevance of DNWR

Previous work on DNWR I

- DNWR is fundamental for Phillips-Curve discussion
- 'Inflation greases wheels of labor market'
- During the last 10 years several empirical studies
- General finding: existence of DNWR but small effects on unemployment

Previous work on DNWR II
Empirical studies

- Most cited: Kahn (1997, AER)
- Histogram location approach
- Subsequently replicated by:
    - Christofides and Leung (2003)
    - Holden and Wulsfberg (2004)
    - Knoppik and Beissinger (2005)
    - Behr (2006)

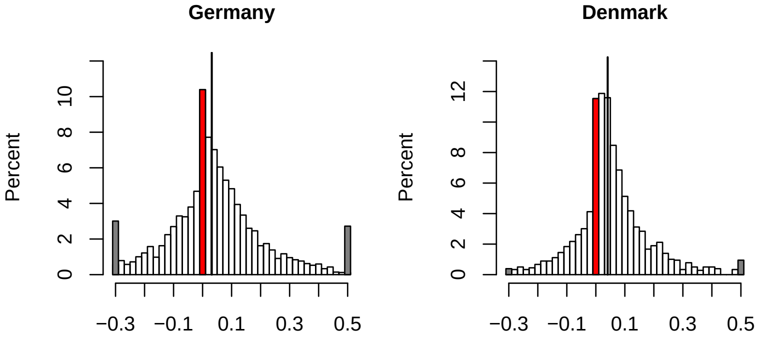
Histogram location approach

- Assumption that constant share ρ of decreasing wages is constant instead
- Pros
  - no distributional assumption
- Cons
  - assumes identical (only shifted, scaled) distributions over time
  - does not allow for valid inference
  - does not allow to estimate yearly extent of DNWR

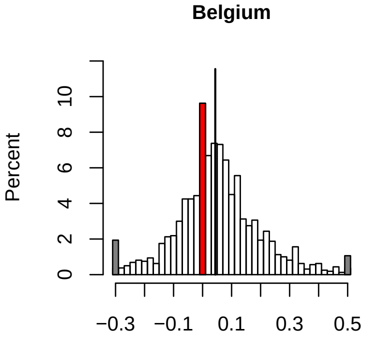
Our parametric approach

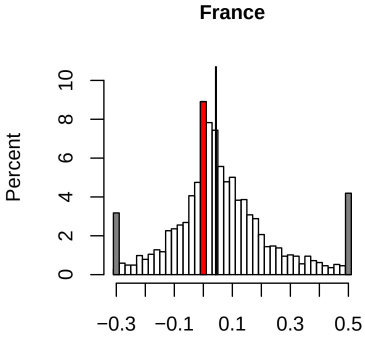
- Assumption that constant share ρ of potential negative wage changes constant due to DNWR
- x is observed wage change, x^c is counterfactual wage change in the absence of rigidity
- Assumption of parametric wage change distribution
- What distribution to choose?

Histograms of wage change distributions 2001, I

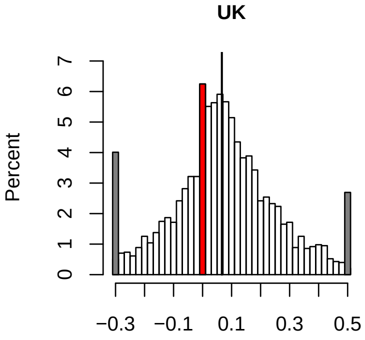


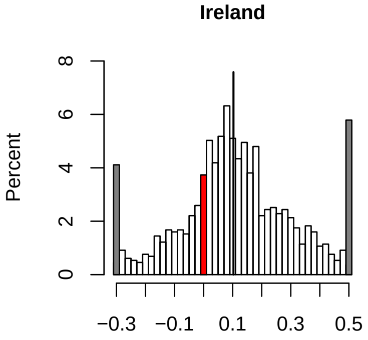
Histograms of wage change distributions 2001, II



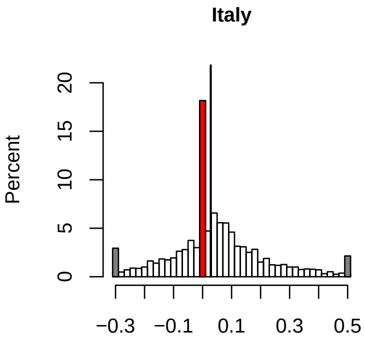


Histograms of wage change distributions 2001, III

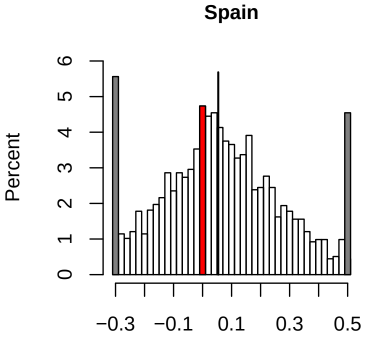


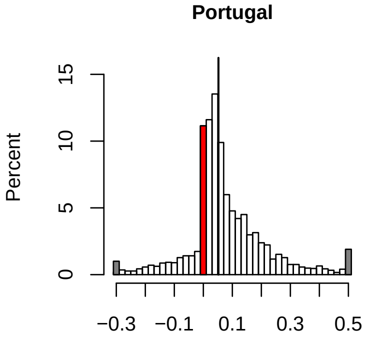


Histograms of wage change distributions 2001, IV



Histograms of wage change distributions 2001, V





Stylized facts of wage change distributions

- unimodal
- asymmetric
- right skewed
- excess kurtosis

Generalized hyperbolic distribution

Characteristics

The generalized hyperbolic distributions

- is specified by five parameters
- has all moments
- can be simulated as Gaussian mixtures using inverse Gaussian as mixture distribution
- can be estimated by ML using numeric methods

Generalized hyperbolic distribution
The density

$$f(x;\Psi) = \kappa \left\{ \delta^2 + (x-\mu)^2 \right\}^{\frac{1}{2}\left(\lambda - \frac{1}{2}\right)} K_{\lambda - \frac{1}{2}} \left(\alpha \sqrt{\delta^2 + (x-\mu)^2} \right) e^{\beta(x-\mu)}$$

where

$$\kappa = \frac{\left(\alpha^2 - \beta^2\right)^{\frac{\lambda}{2}}}{\sqrt{2\pi}\alpha^{\lambda - \frac{1}{2}} K_\lambda \left(\delta \sqrt{\alpha^2 - \beta^2} \right)}$$

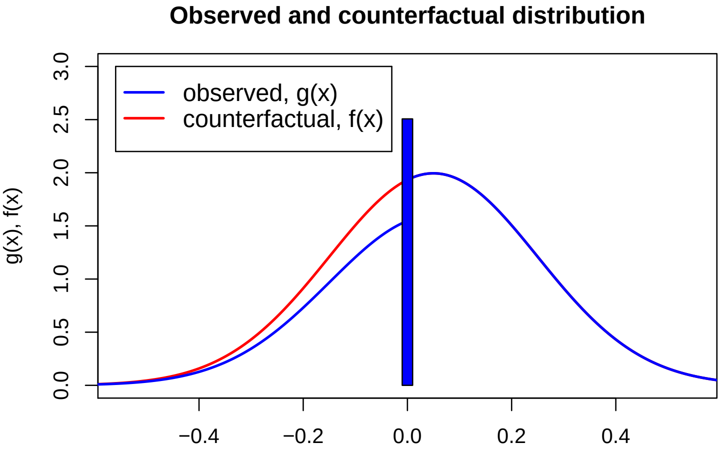
$K_\lambda(\cdot)$	is the modified Bessel function
α	kurtosis parameter
β	skewness parameter
δ	scale parameter
μ	location parameter
λ	Bessel parameter

The rigidity model

- counterfactual density in the absence of rigidity: $f(x)$
- observed density: $g(x)$
- distributions differ for $\Delta log(wage) = x \leq 0$
- Therefore

$$f(x) > g(x) \quad if \quad x < 0$$
$$f(x) = g(x) \quad if \quad x > 0$$

Observed and counterfactual distributions



Relation between $g(x)$ and $f(x)$

$$
\begin{aligned}
g(x) = {} & I(x > \epsilon) f(x) + I(x < -\epsilon)(1-\rho) f(x) \\
& + \frac{I(-\epsilon \le x \le \epsilon)}{2\epsilon} \left[\int_{-\varepsilon}^{\varepsilon} f(u)\, du + \rho \int_{-\infty}^{-\varepsilon} f(u)\, du \right]
\end{aligned}
$$

with indicator function $I(\cdot)$

We estimate the vector of parameters $(\alpha, \beta, \delta, \mu, \lambda)'$ by maximizing numerically the Log Likelihood

$$logL\,(\rho, \Psi|x) = \sum_{i=1}^{n} \log \left(\begin{array}{c} I(x_i > \epsilon) f_{GH}(x_i; \Psi) \\ + I(x_i < -\epsilon)(1-\rho) f_{GH}(x_i; \Psi) \\ + \frac{I(-\epsilon \leq x_i \leq \epsilon)}{2\epsilon} \\ \left[\int_{-\varepsilon}^{\varepsilon} f_{GH}(u:\Psi)\,du + \rho \int_{-\infty}^{-\varepsilon} f_{GH}(u;\Psi)\,du \right] \end{array} \right)$$

Simulation results

- Simulations based on Gaussian mixtures
- Results show that
  - ρ is estimated consistently
  - ρ is estimated with small standard errors
  - standard error of ρ is estimated with high precision

Meaning of ρ

- ρ is conditional relative frequency

$$\rho = \Pr\left(X = 0 | X^c < 0\right)$$

- Share of employees potentially 'constraint' is

$$\omega = \Pr(X^c < 0)$$

- Share of 'constraint' employees is

$$\eta = \rho\omega$$

- ω and therefore η varies with rate of inflation π

Overall wage increase due to rigidity

- Rigidity prevents some wages to fall
- Overall wage increase is higher than in the absence of rigidity
- The model allows to estimate the extent of wage increase

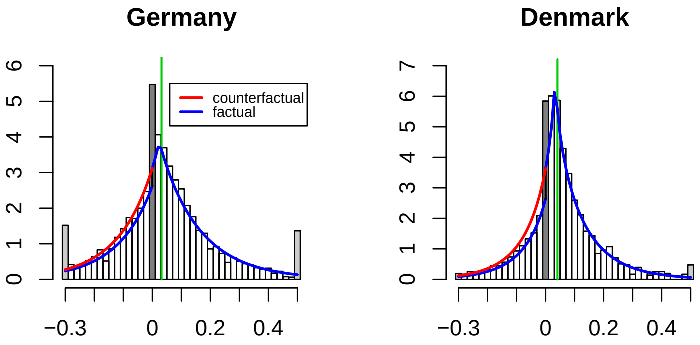
Estimating wage increase due to rigidity

The overall wage increase can be estimated in two ways:

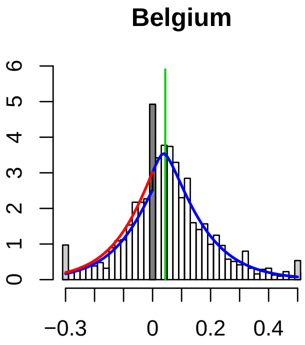
- Based on empirical wages and estimated ρ
- Based on estimated parametric wage distribution and ρ

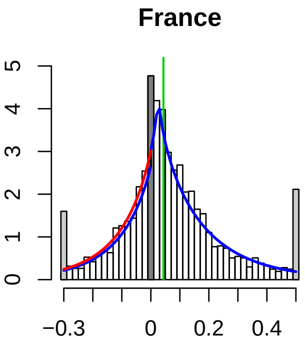
$$E(X^c) = \frac{E(X|X < 0)}{1-\rho} \Pr(X < 0) + E(X|X > 0) \Pr(X > 0)$$

Observed and counterfactual distributions 2001, I

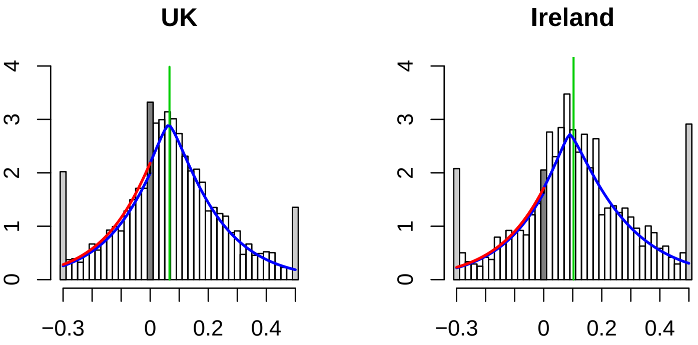


Observed and counterfactual distributions 2001, II

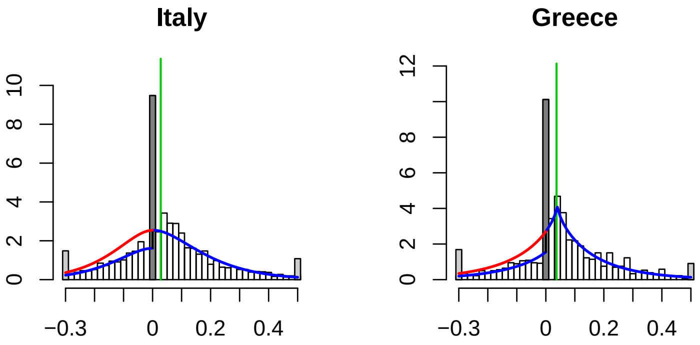




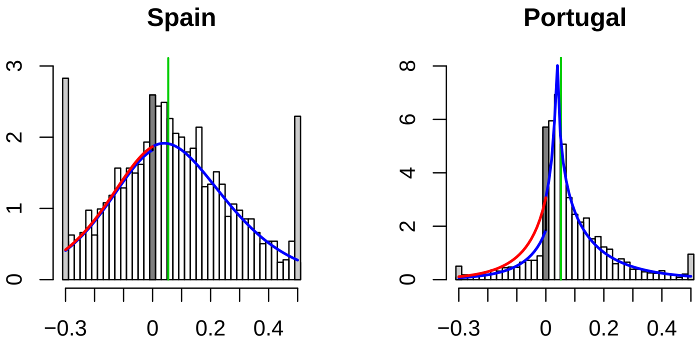
Observed and counterfactual distributions 2001, III)



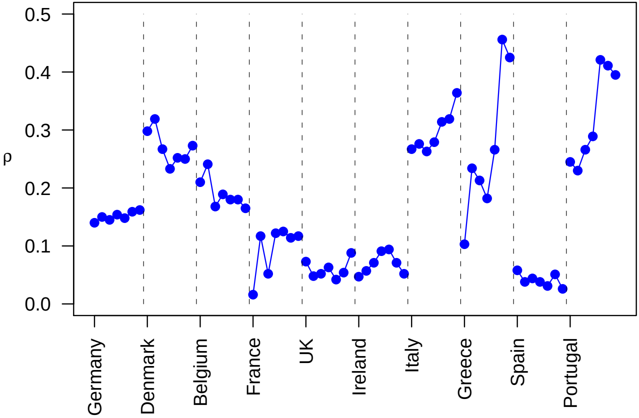
Observed and counterfactual distributions 2001, IV



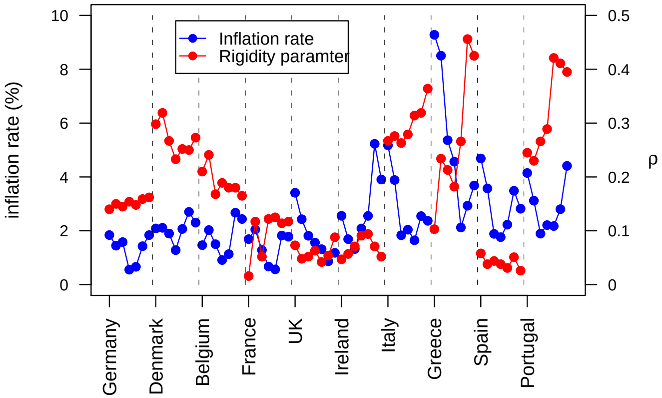
Observed and counterfactual distributions 2001, V



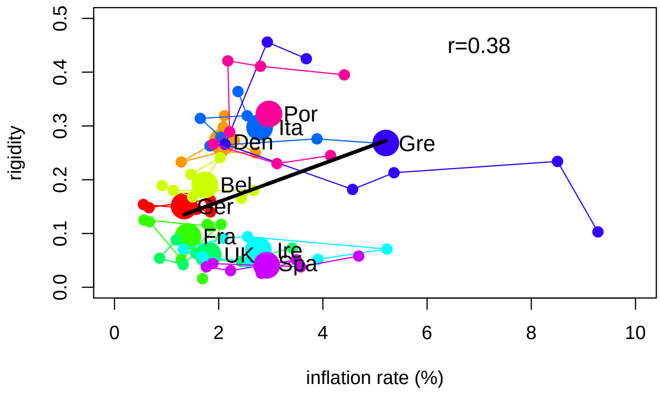
Estimates of rigidity coefficient ρ



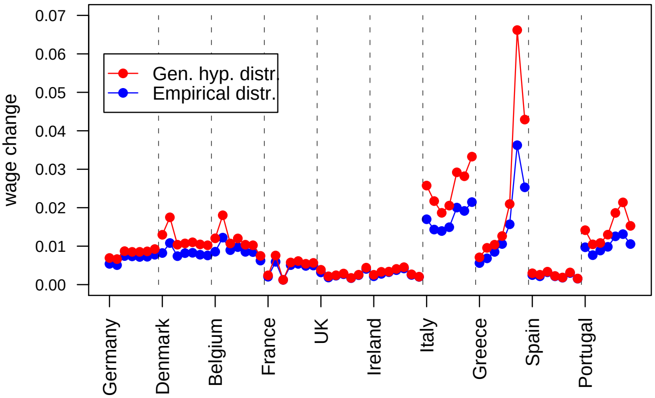
Inflation rates and DNWR I



Inflation rates and DNWR II



Wage increase due to DNWR



Conclusion

- Parametric approach using the Generalized hyperbolic distribution
- allows yearly estimates of rigidity parameter
- strong differences in extent and change of rigidity parameters
- differences are somewhat dampened by positive correlation with inflation rates
- smaller differences in inflation rates will cause higher costs of high rigidity (ρ)

References

- Akerlof, G. / Dickens, W. / Perry, W. (1996), The macroeconomics of low inflation, Brookings Papers on Economic Activity, (1/96), 1–76.
- Barndorff-Nielsen O. (1977), Exponentially decreasing distributions for the logarithm of particle size, Proc. Roy. Soc. Lond., A353, 401–419.
- Eberlein, E. / Keller, U. (1995), Hyperbolic distributions in finance, Bernoulli, 1, 281–299.
- Kahn, S. (1997), Evidence of Nominal Wage Stickiness from Microdata, American Economic Review, 87, 993–1008.