Can Structural Reforms Help Europe?*

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BoI/CEPR/MNB Workshop on
“Growth, Rebalancing, and Macroeconomic Adjustment after Large Shocks”

Budapest—September 20, 2013
Crisis in Europe

- **Large output losses during the 2008-9 global financial crisis**
  - Different speed of recovery (or lack thereof) between core and periphery

![Graph showing Real GDP for Germany, Greece, Ireland, Italy, Portugal, and Spain from 2008 to 2013.](image-url)
Crisis in Europe

- Periphery troubles: Debt crisis but also fundamentals
  - Large external imbalances pre-crisis
  - Significant inflation differentials (real exchange rate misalignments)
Policy Options for the Periphery

- Traditional policy options limited/unavailable:
  - Exchange rate depreciation not an option due to common currency
  - Fiscal expansion not an option because of debt crisis
  - ECB monetary easing limited by zero lower bound (ZLB)
Policy Options for the Periphery

- **Structural reforms** recommended by various agencies to address competitiveness gap and boost income prospects

  “...the biggest problem we have for growth in Europe is the problem of lack of competitiveness that has been accumulated in some of our Member States, and we need to make the reforms for that competitiveness.

  ...to get out of this situation requires...structural reforms, because there is an underlying problem of lack of competitiveness in some of our Member States.”

José Manuel Durão Barroso
President of the European Commission
Closing Remarks following the State of the Union 2012
Strasbourg, September 12, 2012
Source of Competitiveness Gap

- Labor/Product market inefficiencies

![Graph showing the source of competitiveness gap through labor and product market inefficiencies.](image-url)

Questions and Results

What are the aggregate effects of structural reforms in the periphery?

1. In the long run?

2. In the short run, when the ZLB binds?

EFR (Brown-Oxford-Board) Structural Reforms in Europe September 20, 2013 5 / 24
Questions and Results

What are the aggregate effects of structural reforms in the periphery?

- **Machinery**: Off-the-shelf two-country DSGE model of a currency union, where monopoly power gives rise to price and wage markups

- **Experiment**: Permanent reduction in periphery's non-tradable markups by 10 percentage points (close gap with core)

- **Results**:
  1. **Long-run**: Union-wide output increases by about 2.5%
  2. **Short-run**: Output increase crucially relies on monetary accommodation

\* In times of crisis (ZLB), ambitious reforms are contractionary!

\* Temporary reforms involve even larger short-run output costs

**Key intuition**: At ZLB, deflationary impact of reforms raises real interest rate and depresses output
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Roadmap

One-sector, closed economy model:
  - Basic intuition and some analytical results

Two-country, two-sector model of a currency union:
  - Calibration
  - Long-run effects of reforms
  - Short-run effects of reforms in normal times and in a crisis
  - Disentangling the effects of reforms
Textbook New Keynesian Model

AD: \( \hat{Y}_t = \mathbb{E}_t \hat{Y}_{t+1} - \sigma^{-1}(i_t - \mathbb{E}_t \pi_{t+1} - r_t^e) \)

AS: \( \pi_t = \kappa \hat{Y}_t + \beta \mathbb{E}_t \pi_{t+1} + \kappa \psi \omega_t \)
Textbook New Keynesian Model

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- \( \omega_t \equiv \) wedge between first-best and flexible-price output due to:
  - Firms’ market power
  - Markups in labor market
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  - Equilibrium output (short-run=S; long-run=L)
    \[ \hat{Y}_S = -\psi \omega_S \quad \text{and} \quad \hat{Y}_L = -\psi \omega_L \]
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    \[ \hat{Y}_S = -\psi \omega_S \quad \text{and} \quad \hat{Y}_L = -\psi \omega_L \]
  - Structural reforms: \(\omega_t \downarrow \Rightarrow \hat{Y}_S, \hat{Y}_L \uparrow \)
Textbook New Keynesian Model at the ZLB

- Dynamics dramatically change at the ZLB

- Consider a negative shock to \( r_t^e \) (\( r_S^e < 0 \)) such that:
  - Large enough to force \( i_S = 0 \) (\( \pi_t < 0 \)):
  - Reverts back to (absorbing) steady state w/ prob. \( 1 - \mu \) in each period

- Short-run equilibrium:

  \[
  \text{AD: } \hat{Y}_S = \hat{Y}_L + \frac{\sigma^{-1} \mu}{1 - \mu} \pi_S + \frac{\sigma^{-1}}{1 - \mu} r_S^e
  \]

  \[
  = -\psi \omega_L
  \]

  \[
  \text{AS: } \pi_S = \frac{\kappa}{1 - \mu \beta} \hat{Y}_S + \frac{\kappa \psi}{1 - \mu \beta} \omega_S
  \]
Short-Run Equilibrium at the ZLB and Reforms

- **Deflationary effect** of reforms reduces short-run output via AS

\[
\begin{align*}
\text{AD: } \dot{Y}_S &= \dot{Y}_L + \frac{\sigma^{-1}\mu}{1-\mu} \pi_S + \frac{\sigma^{-1}}{1-\mu} r^e_S \\
\text{AS: } \pi_S &= \frac{\kappa}{1-\mu\beta} \dot{Y}_S + \frac{\kappa\psi}{1-\mu\beta} \omega_S
\end{align*}
\]
Short-Run Equilibrium at the ZLB and Reforms

- **Expansionary effect** of reforms increases demand via AD

\[
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\text{AD: } \hat{Y}_S &= \hat{Y}_L + \frac{\sigma^{-1}}{1-\mu} \pi_S + \frac{\sigma^{-1}}{1-\mu} \hat{r}_S e \\
&= -\psi \omega_L \\
\text{AS: } \pi_S &= \frac{\kappa}{1-\mu\beta} \hat{Y}_S + \frac{\kappa\psi}{1-\mu\beta} \omega_S
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Short-Run Equilibrium at the ZLB and Reforms

- **Deflationary effect** of reforms reduces short-run output via AS
- **Income effect** of reforms increases short-run demand via AD
  - Net effect depends on which force dominates (quantitative question)
Short-Run Equilibrium at the ZLB and Reforms

- **Deflationary effect** of reforms reduces short-run output via AS

- **Income effect** of reforms increases short-run demand via AD

  ▶ Net effect depends on which force dominates (quantitative question)

⇒ Calibrated two-country (H,F), two-sector (k=T,N) model of currency union

  ▶ Complete financial markets within each country
  ▶ Incomplete financial markets (risk-free bond) across countries
  ▶ Sector-specific labor supply
  ▶ Monopolistic competition + Nominal rigidities (prices and wages)
  ▶ Inflation targeting regime
Households (Staggered Wage Setting)

- **Utility maximization**

\[
\max_{C_{t+s}, W_{kt+s}(i), B_{t+s}} \mathbb{E}_t \left\{ \sum_{s=0}^{\infty} \beta^s \xi_{t+s} \left[ \frac{C_{t+s}^{1-\sigma}}{1-\sigma} - \frac{L_{wt+s}(i)^{1+\nu}}{1+\nu} \right] \right\}
\]

where

\[
C_t = \left[ \gamma \frac{1}{\phi} C_T^{\frac{\phi-1}{\phi}} + (1-\gamma) \frac{1}{\phi} C_N^{\frac{\phi-1}{\phi}} \right]^{\frac{\phi}{\phi-1}}
\]

\[
C_T = \left[ \omega \frac{1}{\epsilon} C_H^{\frac{\epsilon-1}{\epsilon}} + (1-\omega) \frac{1}{\epsilon} C_F^{\frac{\epsilon-1}{\epsilon}} \right]^{\frac{\epsilon}{\epsilon-1}}
\]

- **Budget constraint**

\[
P_tC_t + \frac{B_t}{\psi_B} = (1+i_{t-1})B_{t-1} + (1-\tau_{kt}^W)W_{kt}(i)L_{kt}(i) + P_t - T_t
\]

where

\[
\psi_B \equiv \exp \left[ -\psi_B \left( \frac{B_t}{P_t Y_t} \right) \right]
\]

- **Labor demand (labor agencies)**

\[
L_{kt}(i) = \frac{1}{\gamma_k} \left[ \frac{W_{kt}(i)}{W_{kt}} \right]^{-\phi_k} L_{kt}(j)
\]
Firms (Staggered Price Setting)

- Profit maximization

\[
\max_{\tilde{P}_{kt}(j)} \mathbb{E}_t \left\{ \sum_{s=0}^{\infty} \zeta_p Q_{t,t+s} \left[ (1 - \tau_{kt+s}^P) \tilde{P}_{kt}(j) - \frac{W_{kt+s}}{Z_{kt+s}} \right] Y_{kt+s}(j) \right\}
\]

- Technology

\[
Y_{kt}(j) = Z_{kt} L_{kt}(j)
\]

- Product demand (retailers)

\[
Y_{kt}(j) = \frac{1}{\gamma_k} \left[ \frac{P_{kt}(j)}{P_{kt}} \right]^{-\theta_k} Y_{kt}
\]
Monetary Policy

- Strict inflation targeting

\[ \Pi_t^{MU} = \bar{\Pi} \]

where

\[ \Pi_t^{MU} = (\Pi_t)^{0.5} (\Pi_t^*)^{0.5} \]
Monetary Policy

- Strict inflation targeting

\[ \Pi_t^{MU} = \bar{\Pi} \]

where

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- Solve model non-linearly under perfect foresight, taking ZLB into account

\[ i_t \geq i^{zlb} \geq 0 \]
Government Policy

- Periphery steady state markups \( (\mu^j_k, j = \{p, w\}, k = \{H, N\}) \)

\[
\mu^p_k = \frac{1}{1 - \tau^p_k \theta_k} \theta_k - 1 \\
\mu^w_k = \frac{1}{1 - \tau^w_k \phi_k} \phi_k - 1
\]
Government Policy

- Periphery steady state markups ($\mu^j_k, j = \{p, w\}, k = \{H, N\}$)

$$\mu^p_k = \frac{1}{1 - \tau^p_k \theta_k} \theta_k \psi_k$$

$$\mu^w_k = \frac{1}{1 - \tau^w_k \phi_k} \phi_k \psi_k$$

- Periphery product and labor market reforms: Cut $\tau^j_k$
Government Policy

- Periphery steady state markups \( \mu^j_k, j = \{p, w\}, k = \{H, N\} \)
  \[
  \mu^p_k = \frac{1}{1 - \tau^p_k} \frac{\theta_k}{\theta_k - 1}, \quad \mu^w_k = \frac{1}{1 - \tau^w_k} \frac{\phi_k}{\phi_k - 1}
  \]

- Periphery product and labor market reforms: Cut \( \tau^j_k \)

- Subsidies financed through lump-sum taxes
  \[
  \mathcal{T}_t = \int_0^1 \tau^p_{kt} P_{kt} Y_{kt}(j) dj + \int_0^1 \tau^w_{kt} W_{kt} L_{kt}(i) di
  \]
Calibration of Markups

- Estimates of **product market markups** (OECD, 2005)

<table>
<thead>
<tr>
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**Note:** Periphery: Italy and Spain. Core: France and Germany.
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  - Average wage bargaining power in Europe (Everaert and Schule, 2006)
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  - Wage premia by sector (Jean and Nicoletti, 2002)
  - Average wage bargaining power in Europe (Everaert and Schule, 2006)
  - Numbers for $\phi_k$ comparable with product market estimates (Bayoumi, Laxton and Pesenti, 2004; Forni, Gerali and Pisani, 2010)
### Other Parameters

#### Households

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<th>Value</th>
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<tr>
<td>Individual discount factor $\beta$</td>
<td>0.99</td>
</tr>
<tr>
<td>Elasticity of intertemporal substitution $\sigma^{-1}$</td>
<td>2</td>
</tr>
<tr>
<td>Inverse Frisch elasticity $\nu$</td>
<td>2</td>
</tr>
<tr>
<td>Home bias $\omega$</td>
<td>0.57</td>
</tr>
<tr>
<td>Consumption share of tradable goods $\gamma$</td>
<td>0.38</td>
</tr>
<tr>
<td>Elasticity of substitution tradables-nontradables $\epsilon$</td>
<td>0.5</td>
</tr>
<tr>
<td>Elasticity of substitution Home-Foreign tradables $\phi$</td>
<td>1.5</td>
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</table>

#### Price and Wage Setting

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<tr>
<td>Probability of not being able to adjust prices $\zeta_p$</td>
<td>0.66</td>
</tr>
<tr>
<td>Probability of not being able to adjust wages $\zeta_w$</td>
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#### Monetary Policy

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<tr>
<td>Inflation target $\bar{\Pi}$</td>
<td>1</td>
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<tr>
<td>Effective lower bound on nominal interest rate $j^{zlb}$</td>
<td>0.0025</td>
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Structural Reforms in Normal Times

- **Experiment**: Permanently cut $\tau^p_N$ and $\tau^w_N$ by 1 p.p. (Periphery $\rightarrow$ Core)

- **Long-run effects:**
  - Reduction in markups boosts union-wide output by 0.25%
  - Quantitatively in line with literature

- Periphery reduces competitiveness gap through large decline in relative price of non-traded goods
Structural Reforms in Normal Times

- **Experiment:** Permanently cut $\tau^p_N$ and $\tau^w_N$ by 1 p.p. (Periphery $\rightarrow$ Core)

- **Short-run effects:** Reforms are expansionary
Structural Reforms in a Crisis

- Crisis generated via symmetric shock to discount factor
  - Calibrated to match $\approx 4\%$ drop in EMU output during global financial crisis

![Output Graph]
![Inflation Graph]
![Nominal Interest Rates Graph]
![Real Interest Rate Graph]
Structural Reforms in a Crisis

- Crisis generated via symmetric shock to discount factor
  - Calibrated to match $\approx 4\%$ drop in EMU output during global financial crisis

- Short-run effects: At the ZLB, reforms are contractionary!

Impact response of aggregate variables

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<thead>
<tr>
<th>$\tau^p_N = \tau^w_N$ (in p.p.)</th>
<th>Output</th>
<th>Inflation</th>
<th>Real Rate</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>-4.0</td>
<td>-1.0</td>
<td>1.9</td>
</tr>
<tr>
<td>1</td>
<td>-4.1</td>
<td>-1.5</td>
<td>2.2</td>
</tr>
<tr>
<td>5</td>
<td>-4.6</td>
<td>-3.6</td>
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</tr>
<tr>
<td>10</td>
<td>-5.1</td>
<td>-6.2</td>
<td>5.1</td>
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Structural Reforms in a Crisis: Key Mechanism

- Short-run effects of 1 p.p. permanent cut in non-tradable product and labor market markups:
  - In normal times: $\approx +2\%$
  - In a crisis: $\approx -0.1\%$
Structural Reforms in a Crisis: Key Mechanism

- Short-run effects of 1 p.p. permanent cut in non-tradable product and labor market markups:
  - In normal times: $\approx +2\%$
  - In a crisis: $\approx -0.1\%$

- Key mechanism:
  - In a crisis, reforms worsen deflationary pressures
  - ZLB constrains ability to provide monetary stimulus
  - Higher real interest rate further depresses output
Effects of Temporary Reforms in a Crisis

- Adoption of structural reforms in a crisis may lead to political backlash and social unrest
  - Example: Debate over labor reforms in recent Italian elections
Effects of Temporary Reforms in a Crisis

- Adoption of structural reforms in a crisis may lead to political backlash and social unrest
  - Example: Debate over labor reforms in recent Italian elections

- Experiment: Temporary reforms
  - Reforms are implemented in a crisis...
  - ...but unwound when ZLB stops being binding
  - Agents correctly foresee reforms to be temporary

\[
\begin{align*}
\text{c} & = \text{t} \\
\text{w} & = -1 \text{ p.p.}
\end{align*}
\]
Effects of Temporary Reforms in a Crisis

\[ \tau^P_N = \tau^W_N = -1 \text{ p.p.} \]

![Graphs showing the effects of temporary reforms on output, inflation, real interest rate, and current account.](image-url)
Disentangling the Effects of Reforms in a Crisis

Two Experiments

1. Temporary collusion

2. Credible announcement about future reforms
Disentangling the Effects of Reforms in a Crisis

Two Experiments

Eggertsson (2012): At ZLB, higher markups can be expansionary

- State-contingent design of “New Deal” policy ($\phi_\tau > 0$)

$$\tau^p_{Nt} = \tau^w_{Nt} = \tau^t_{Nt} = -\min\left\{0, \phi_\tau \left[(1 + i) \left(\Pi_t^{MU}\right)^{\phi_\pi} - (1 + i_{ZLB})\right]\right\}$$
Disentangling the Effects of Reforms in a Crisis

Two Experiments

1. Eggertsson (2012): At ZLB, higher markups can be expansionary
   - State-contingent design of “New Deal” policy ($\phi_\tau > 0$)
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     \tau^p_{Nt} = \tau^w_{Nt} = \tau^{nd}_t = -\min \left\{ 0, \phi_\tau \left[ (1 + i) \left( \Pi^MU_t \right)^{\phi_\pi} - (1 + i^{ZLB}) \right] \right\}
     \]

2. Fernandez-Villaverde, Guerron-Quintana and Rubio-Ramirez (2012): Announce reforms implemented when ZLB stops being binding
   - State-contingent design of “Delay” policy
     \[
     \tau^p_{Nt} = \tau^w_{Nt} = \tau^d_t = -\max \left\{ 0, \tau \left[ (1 + i) \left( \Pi^MU_t \right)^{\phi_\pi} - (1 + i^{ZLB}) \right] / (i - i^{ZLB}) \right\}
     \]
Disentangling the Effects of Reforms in a Crisis
Two Experiments

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     \]
Disentangling the Effects of Reforms in a Crisis

Two Experiments

\[ \tau_N^p = \tau_N^w = -10 \text{ p.p. for “Delay”} \]
Conclusions

- Structural reforms boost output over long-run horizon and reduce competitiveness gap between Core and Periphery
  - 10 p.p. reduction of product and labor market markups
    - ≈ 2.5% increase in union-wide output
    - ≈ 6.5% depreciation of periphery real exchange rate

But short-run effects crucially depend on central bank ability to provide monetary accommodation

- In normal times, reforms generate output booms
- In crisis times (ZLB), ambitious reforms can substantially deepen the recession

Key insight: At ZLB, deflationary impact of reforms raises real interest rate and further depresses output
Conclusions

- Structural reforms boost output over long-run horizon and reduce competitiveness gap between Core and Periphery
  - 10 p.p. reduction of product and labor market markups
    - ≈ 2.5% increase in union-wide output
    - ≈ 6.5% depreciation of periphery real exchange rate

- But short-run effects crucially depend on central bank ability to provide monetary accommodation
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Conclusions

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Open Economy Dimension

- Do structural reforms address

1. Competitiveness gap between periphery and core?

2. External imbalances between periphery and core?
Open Economy Dimension

Do structural reforms address

1. **Competitiveness gap** between periphery and core?
   Yes, long run RER depreciation of almost 7%

2. **External imbalances** between periphery and core?
   No, CA improves by less than 1%

Competitiveness gap mostly in non-tradable sector

- Structural reforms reduce relative price of NT but do not affect TOT

Alternative experiment: Demand shock only hits periphery

- Large adjustment of terms of trade and current account

> \[ \tau_p^N = -1 \text{ p.p.} \]

But just a function of asymmetric nature of shock

---

EFR (Brown-Oxford-Board)
Open Economy Dimension

- Alternative experiment: Demand shock only hits periphery
Open Economy Dimension

- Alternative experiment: Demand shock only hits periphery
  - Main result goes through

### Impact response

<table>
<thead>
<tr>
<th>( \tau^p_N = \tau^w_N ) (in p.p.)</th>
<th>Output</th>
<th>Inflation</th>
<th>Real Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Symm</td>
<td>Asymm</td>
<td>Symm</td>
</tr>
<tr>
<td>0</td>
<td>-3.95</td>
<td>-3.95</td>
<td>-0.95</td>
</tr>
<tr>
<td>1</td>
<td>-4.07</td>
<td>-3.99</td>
<td>-1.40</td>
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<tr>
<td>5</td>
<td>-4.51</td>
<td>-4.19</td>
<td>-3.12</td>
</tr>
<tr>
<td>10</td>
<td>-5.03</td>
<td>-4.41</td>
<td>-5.22</td>
</tr>
</tbody>
</table>
Open Economy Dimension

- Alternative experiment: Demand shock only hits periphery
  - Large adjustment of terms of trade and current account

$$\tau^p_N = \tau^w_N = -1 \text{ p.p.}$$

- But just a function of asymmetric nature of shock
Sensitivity to $\sigma^{-1}$

- Results balance
  - Long-run wealth effect: Higher output in new steady state
  - Short-run substitution effect: High real interest rated due to ZLB

- Elasticity of intertemporal substitution affects this balance

Experiment: $\tau^p_N = \tau^w_N = -10$ p.p.

<table>
<thead>
<tr>
<th>$\sigma^{-1}$</th>
<th>2</th>
<th>1</th>
<th>0.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Y_{1MU}$</td>
<td>-5.03</td>
<td>-3.90</td>
<td>-3.53</td>
</tr>
</tbody>
</table>

Note: Shock such that $Y_{1MU} = -3.95\%$ with $\tau^p = \tau^w = \tau$ as $\sigma$ varies
Sensitivity to $\varphi_{\pi}$

- Implement strict inflation targeting via Taylor rule

\[
1 + i_t = \max \left\{ 1 + i^{Zlb}, (1 + i) \left( \Pi_t^{MU} \right)^{\varphi_{\pi}} \right\}
\]

<table>
<thead>
<tr>
<th>$\varphi_{\pi}$</th>
<th>$Y_1^{MU}$</th>
<th>ZLB Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Crisis</td>
<td>Permanent</td>
</tr>
<tr>
<td>10</td>
<td>-3.95</td>
<td>-4.07</td>
</tr>
<tr>
<td>20</td>
<td>-3.95</td>
<td>-4.06</td>
</tr>
<tr>
<td>5</td>
<td>-3.95</td>
<td>-4.04</td>
</tr>
<tr>
<td>2</td>
<td>-3.95</td>
<td>-3.88</td>
</tr>
</tbody>
</table>

- Crisis: $\tau^p_N = \tau^w_N = \tau$

- Permanent: $\tau^p_N = \tau^w_N = -1$ percentage point