Downward Nominal Wage Rigidity in Canada: Evidence against a ‘Greasing Effect’

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Motivation

- For a variety of reasons workers as well as firms are often reluctant to lower wages in response to poor labour-market conditions.
- As a result, DNWR *could* cause labour-market corrections occur disproportionately through the employment margins rather than through reduced wages.
- These downward nominal wage rigidities (DNWR) have been identified as a justification for positive inflation targets.
Main Questions

Questions

- To what extent does DNWR explain the joint dynamics of unemployment and wage inflation in Canada?
- Do higher inflation targets cause a ‘Greasing Effect’ in the short run?

Answers

- Evidence of DNWR in Canada. DNWR helps explain the joint dynamics of unemployment and wage inflation during the Great Recession.
- Higher inflation targets *do not* shorten the overall recovery time nor attenuate the response of unemployment.
Downward Nominal Wage Rigidity

DNWR in Canada

- Brouillete, D., Kostyshyna O. and N. Kyui, (2015a)
  - Evidence suggests that DNWR increased in Canada during the Great Recession.
Downward Nominal Wage Rigidity

Short-Run Wage Phillips Curves
Canada and the United States
2008Q1 to 2012Q4
Model Framework

- DGE model with DNWR by Daly and Hobijn (2014).
- Each period a random fraction $\lambda$ of workers will be unable to adjust wages downward (if required).
- The household is populated by members with a variety of costlessly differentiable labour types.
- Agents are forward looking and make optimal wage setting decisions in response to:
  - Aggregate shocks: Productivity and Preference shocks
  - Idiosyncratic shocks: Labour disutility shock
- Goods production is perfectly competitive
Households

Households Lifetime Utility

\[ \sum_{t=0}^{\infty} \beta^t e^{-\sum_{s=0}^{t-1} D_s} \left[ \ln C_t - \frac{\gamma}{\gamma + 1} \int_0^1 Z_{it} L_{it}^{\gamma + 1} di \right], \quad \gamma > 0 \]

- \( C_t \) household consumption
- \( L_{it} \) labour supplied by member \( i \) of the household
- \( Z_{it} \) denotes the time dependent idiosyncratic disutility
  - where \( \ln(Z) \) is \( N \left( -\frac{\sigma^2}{2}, \sigma \right) \) with \( E(Z) = 1 \).
- \( D_s \) is a preference shock, \( \beta \) subjective discount factor, \( \gamma \) the Frisch elasticity of labour supply

Household’s budget constraint

\[ B_t + P_t C_t = (1 + i_{t-1}) B_{t-1} + \int_0^1 W_{it} L_{it} di. \]
Firms

Production

\[ Y_t = A_t L_t. \]

Production Technology

\[ A_t = (1 + a_t) A_{t-1} \]

Aggregate Labour

\[ L_t = \left[ \int_0^1 L_{it}^{\frac{\eta-1}{\eta}} \, di \right]^{\frac{\eta}{\eta-1}} \]

Labour Demand Function

\[ L_{it} = \left( \frac{W_t}{W_{it}} \right)^{\eta} L_t \]

Aggregate Wage Rate

\[ W_t = \left[ \int_0^1 \left( \frac{1}{W_{it}} \right)^{\eta-1} \, di \right]^{-\frac{1}{\eta-1}} \]
Downward Wage Rigidity

With DNWR, a fraction of the household members $\lambda$ are unable to adjust wages downward ($w' \geq w$) when required.

Household member $i$ maximize

$$V_t(w) = (1 - \lambda) \int_0^\infty \max_{w_{it} \geq 0} \left( \Omega(Z_{it}, w_{it}, L_t) + \beta e^{-D_t} V_{t+1}(w') \right) dF(Z_{it})$$

$$+ \lambda \int_0^\infty \max_{w_{it} \geq w} \left( \Omega(Z_{it}, w_{it}, L_t) + \beta e^{-D_t} V_{t+1}(w') \right) dF(Z_{it}).$$

Where $F(Z_{it})$ denotes the distribution of the idiosyncratic disutility shock $Z_{it}$

$$\Omega(Z_{it}, w_{it}, L_t) = w_{it}^{1-\eta} - \frac{\gamma}{\gamma + 1} Z_{it} w_{it}^{-\eta} \frac{\gamma + 1}{\gamma} L_t \frac{\gamma + 1}{\gamma}$$

Detrended real wage in period $t + 1$ is

$$w' = w_{it} / ((1 + \pi_{t+1})(1 + a_{t+1}))$$
Labour supply

\[ L_t = \left( \frac{\eta - 1}{\eta} \right) \frac{\gamma}{1 + \gamma} \left( \frac{1}{Z_t^*} \right) \frac{\gamma}{1 + \gamma} \]

Aggregate disutility

\[ Z_t^* = \left( 1 - \lambda \right) \int_0^\infty \left( \frac{1}{Z_{it}} \right) \frac{\gamma (\eta - 1)}{\eta + \gamma} \left( \frac{w_t^f (Z_{it})}{w_t^* (Z_{it})} \right)^{\eta - 1} dF(Z_{it}) \]

\[ + \lambda \int_0^\infty \left( \frac{1}{Z_{it}} \right) \frac{\gamma (\eta - 1)}{\eta + \gamma} G_{t-1} \left( \frac{w^*_t (Z_{it}) (1 + \pi_t)(1 + a_t)}{w^*_t (Z_{it})} \right)^{\eta - 1} dF(Z_{it}) \]

\[ + \lambda \int_0^\infty \left( \frac{1}{Z_{it}} \right) \frac{\gamma (\eta - 1)}{\eta + \gamma} \left[ \int_{w^*_t (Z_{it})}^\infty (1 + \pi_t) g_{t-1} (w(1 + \pi_t)(1 + a_t)) \left( \frac{w_t^f (Z_{it})}{w_t^* (Z_{it})} \right)^{\eta - 1} dw \right] dF(Z_{it}) \]

where \( G_t(w) \) is the distribution of real wages across workers
Taylor Rule

\[ i_t = \frac{(1 + \bar{\pi})(1 + \bar{a})}{\beta} \left( \frac{y_t}{\bar{y}} \right) ^{\phi Y} \left( \frac{1 + \pi_t}{1 + \bar{\pi}} \right)^{1 + \phi \pi} - 1 \]

- $\bar{\pi}$ and $\bar{a}$ are steady-state inflation and growth rates respectively.
- $\frac{y_t}{\bar{y}}$ is the output gap with $\phi Y$ its weight.
- $\frac{1 + \pi_t}{1 + \bar{\pi}}$ is the inflation gap with $1 + \phi \pi$ its weight.
- $r_t = (1 + i_t)/(1 + \pi_{t+1}) - 1$
## Calibration

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Function</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\eta$</td>
<td>Labour demand elasticity</td>
<td>1.33</td>
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<tr>
<td>$\gamma$</td>
<td>Frisch elasticity of labour supply</td>
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<td>$\beta$</td>
<td>Discount factor</td>
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<td>$\bar{\pi}$</td>
<td>Target inflation</td>
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<tr>
<td>$\phi_Y$</td>
<td>Taylor rule parameter for the output gap</td>
<td>1</td>
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<tr>
<td>$\phi_\pi$</td>
<td>Taylor rule parameter for the inflation gap</td>
<td>0.3</td>
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<tr>
<td>$\bar{a}$</td>
<td>Technological growth rate</td>
<td>0.005</td>
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<tr>
<td>$\sigma$</td>
<td>Standard deviation of the idiosyncratic disutility shock to labour</td>
<td>0.294</td>
</tr>
<tr>
<td>$\epsilon_D$</td>
<td>Size of the demand shock</td>
<td>-0.0124</td>
</tr>
<tr>
<td>$\rho_D$</td>
<td>Persistence of the demand shock</td>
<td>0.95</td>
</tr>
<tr>
<td>$\lambda$</td>
<td>Calvo parameter for wages</td>
<td>(0.40, 0.70, 0.85, 0.99)</td>
</tr>
</tbody>
</table>
Two Specific Questions:

1. To what extent does DNWR explain the joint dynamics of unemployment and wage inflation following an economic downturn in Canada?

2. Do higher inflation targets cause a 'Greasing Effect' in the short run?
Evolution of the SRAS and the AD Curve to a Negative Demand Shock

- Wage Inflation
- SRAS
- AD
- Unemployment
- t=0
Impulse Response Functions

Negative Demand Shock

(a) Interest Rates (Annualized)

(b) Wage Inflation (Annualized)

(c) Increase in the Percentage of Workforce Accepting a Nominal Wage Freeze

(d) Unemployment Gap

\[ \lambda = (0.40, 0.70, 0.85, 0.99) \]
Response to a Negative Demand Shock

Short-Run Phillips Curves
Varying Degrees of DNWR

[Graph showing Wage Inflation and Unemployment Gap for different values of Lambda: Canadian Data, Lambda=0.7, Lambda = 0.8, Lambda=0.85, Lambda=0.9]
Response to a Negative Demand Shock

Wage Growth Distribution

Frequency (percent)

Spike at zero (percent)

Phillips Curve

Unemployment Gap

DNWR Spike (right axis)

t=0

Wage Inflation

Unemployment Gap

DNWR

ΔlnW (× 100)
Results: Roadmap

Two Specific Questions:

1. To what extend does DNWR explain the joint dynamics of unemployment and wage inflation following an economic downturn in Canada?

2. Do higher inflation targets cause a 'Greasing Effect' in the short run?
DNWR over the Business Cycle

Wage Growth Distribution

\[ \bar{\pi} = 2\% \text{, } \bar{\pi} = 5\% \]
Impulse Response Functions

Negative Demand Shock

(a) Interest Rates (Annualized)

(b) Wage Inflation (Annualized)

(c) Increase in the Percentage of Workforce Accepting a Nominal Wage Freeze

(1\% , \ 2\% , \ 5\%)

(d) Unemployment Gap
Main Questions

- To what extend does DNWR explain the joint dynamics of unemployment and wage inflation in Canada?
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Answer

- Evidence of DNWR in Canada. DNWR helps explain the joint dynamics of unemployment and wage inflation during the Great Recession
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