The Microeconomic Determinants of Older Employment
Evidence from Belgium and Abroad

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Outline

1. Context
2. Tentative framework: a (labour) supply & demand story
3. Empirical evidence (with a focus on Belgium)
   - Country-level
   - Firm-level
4. Some success stories
5. Policy recommendations
1. Context

Ageing (rising health & pension costs)...

... and the understandable desire to expand an older employment rate that remains relatively low.
Weakness of older Employment rate in Belgium

Women

Men
2. Framework

• The existing literature, and most policy initiatives, have focused on supply-side determinants (i.e. the role of pension, early-retirement schemes in fostering withdrawal for the labour market…)

• But one should not ignore the role of demand-side barriers (reluctance of firms to (re)employ older workers)
<table>
<thead>
<tr>
<th>Supply-Side</th>
<th>Demand-side</th>
</tr>
</thead>
</table>
| - Generosity of replacement earnings  
  - (Early) pensions benefits  
  - Unemployment benefits  
  - Disability benefits  
| - Seniority wages  
- Employment protection  
- Severance costs  
|   |
| - Health or family considerations |
|   |
|   |
| - Productivity decline |
3. The Empirical Evidence

3.1 Country-level evidence
  – What OECD/EU-SILC country-level data reveal

3.2 Firm-level evidence
(Bel-first + social security data)
  - The Employment consequences of steeper wage-age gradients in Belgium
  - The productivity and profitability consequences of larger shares older workers
3.1. Country-level: Youth vs Old: no evidence of crowding out … on the contrary

Percentage of 55-59 year-olds and 20-24 year-olds in employment, 2009.)
### Country-level – OECD 2006

\[ \text{OER}_j = f (BC_j, \text{SCHOOL}_j, \text{PENSION}_j, \text{EMPL_PROT}_j, \text{WAGE SETTING}_j, \text{TAXES}_j, \text{REL_WAGE}_j, \text{GENDER*AGE}_j) \]

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP growth</td>
<td>-44,728</td>
<td></td>
</tr>
<tr>
<td>Empl. rate of prime-age (40-44)</td>
<td>1,012</td>
<td>***</td>
</tr>
<tr>
<td>Years of schooling</td>
<td>1,259</td>
<td>*</td>
</tr>
<tr>
<td>Legal retirement age</td>
<td>1,667</td>
<td>***</td>
</tr>
<tr>
<td>Net replacement rate (at 1.5 of the median wage)</td>
<td>-0,167</td>
<td>**</td>
</tr>
<tr>
<td>Degree of coverage of collective wage bargaining</td>
<td>0,146</td>
<td>*</td>
</tr>
<tr>
<td>Degree of centralisation of wage setting</td>
<td>-1,725</td>
<td></td>
</tr>
<tr>
<td>Employment protection index</td>
<td>1,199</td>
<td></td>
</tr>
<tr>
<td>Relative gross wage (55-64/35-44)</td>
<td>-22,515</td>
<td>*</td>
</tr>
<tr>
<td>Tax wedge</td>
<td>-0,427</td>
<td>**</td>
</tr>
<tr>
<td>MEN 5054 (ref: WOMEN 6064)</td>
<td>42,573</td>
<td>***</td>
</tr>
<tr>
<td>MEN 5559</td>
<td>29,486</td>
<td>***</td>
</tr>
<tr>
<td>MEN 6064</td>
<td>-1,164</td>
<td></td>
</tr>
<tr>
<td>WOMEN 5054</td>
<td>45,014</td>
<td>***</td>
</tr>
<tr>
<td>WOMEN 5559</td>
<td>27,585</td>
<td>***</td>
</tr>
</tbody>
</table>

Countries: AUS, AUT, BEL, CZE, DEU, DNK, ESP, FIN, FRA, GBR, ITA, NLD, NOR, POL, PRT, SVK, SWE, USA
3.2 Firm-level The Employment consequences of steeper wage-age gradients in Belgium

Wage-age profiles, 2010

Source= Belfirst. (*)Adjusted for part-time worker
\[ \text{LnWAGE}_{ij} = \alpha + \beta_j \text{AGE}_{ij} + \rho \ln Y_j \]

Old Employment Outcome \(_j = f(\hat{\beta}_j, \text{Controls}_j)\)
Firm-level – The productivity and profitability consequences of larger shares of older workers

Productivity

\[ \ln Y_{it} = f(K_{it}, L_{it}, \text{AGE SHARES}_{it}) \]

Gross profits (employability)

\[ \ln(Y_{it}/W_{it}) = g(K_{it}, L_{it}, \text{AGE SHARES}_{it}) \]

Key results

<table>
<thead>
<tr>
<th>Main result: large shares of workers aged 50-64 cause</th>
<th>Productivity</th>
<th>Profitability</th>
</tr>
</thead>
<tbody>
<tr>
<td>↓↓</td>
<td>↓↓</td>
<td></td>
</tr>
</tbody>
</table>

Extensions: if older workers

- are women (ref=men)
  - ↓↓↓
  - ↓↓
- are employees (ref=blue-collar)
  - ↓↓
  - ↓
- work in service industry (ref=manufacturing)
  - ↓
  - ↓
- work in larger firms (ref=medium & small)
  - --
  - --
- work in training-intensive firms (ref= no or little training)
  - ↓↓
  - ↓
4. Success stories

4.1. Successful firms
BMW “Oldsters Beat Youngsters in BMW Assembly-Line Test”

• In 2007, BMW set up an experimental assembly line with older employees to see whether they could keep pace. The production line features stools to spare aging backs, *adjustable-height work benches*, and *wooden floors* instead of rubber to help hips swivel during repetitive tasks.

• The verdict: not only could they keep up, the older workers did a better job than younger staffers on another line at the same factory.

• Today, many of the changes are being implemented at plants across the company.
Horndal steel-plant in central Sweden

- Between 1930 and 1950 annual growth rate in productivity of 2.5 percent
- Horndal had a very aged workforce
  - In 1930, 34% of the workers at Horndal were 50+
  - In 1950, 50% ...

- Horndal suggests that workforce ageing is not a problem for productivity
4.2 A successful country: Sweden

*Horizon*: extension of the right to stay in employment from 65 to 67 (2001), discussions to extend to 69

*Supply-side*: The pension reform of the 1990’s (from defined benefit to defined contribution) introduces strong financial incentives to stay active. Simultaneously, the alternative exit routes have been closed.

*Demand-side:*

- Moderate seniority wage (compare to Belgium, France), declining wage >55
- Reduced social contribution >65
- More attention to workplace ergonomics
- Higher incidence of training
Gross wage profile: Belgium vs. Sweden

Source: EU-SILC 2006-2007
Figure 2.1: Participation in training and labour market participation of people aged 55-64 in Europe (top panel); participation in training and labour market participation differential between the age groups 55-64 and 25-54, 2006

Source: Eurostat, 2007
5. Policy Recommendations

1. Boost supply
   1.1. Expand Horizon (legal age of retirement)
   1.2. Make it less financially attractive to retire (replacement rate)
   1.3. Better control alternative exit routes (disability…)

2. Entice demand
   2.1. Combat age-related productivity decline
       - Invest in ergonomics/work environment (BMW…)
       - Develop training among 40-50 year-old workers (Sweden)
   2.2. Labour costs
       - Moderate seniority-based wage rises
       - Conditional on social partners committing to [1],[2], [3], selectively reduce tax wedge on older labour

3. Improve intermediation (activate older unemployed)
   - “Seek and Ye Shall Find” J. van Ours (2012)
Appendices
A high share of involuntary retirement (55-64)

Source: ISSP2005
Implicit contracts
What needs to change if the (implicit) age of retirement is raised

Productivity
Wage

Productivity
Wage

25  55  65

A  B

wage 1  wage 2
Implicit contracts and wage dynamics in case of job change

Productivity
Wage

Employer 1

Employer 2

Seniority 1
55
Seniority 2

wage 1

wage 2

100

Wage 55
**Implicit contracts and negative shocks - Impact on departure age**

**Productivity**

**Wage**

---

**End of implicit contract**

52 55

A* B*
Average earnings by age: full-time male workers, 2008

Source: D'Addio et al. (2010) based on OECD Earnings Database.
Model and Econometrics

Equ. 1: average productivity

\[ \ln \left( \frac{Y_{i,t}}{L_{i,t}} \right) = \ln A + \alpha \ln QL_{i,t} + \beta \ln K_{i,t} - \ln L_{i,t} \]

where: \( Y_{i,t} \) is the firm’s value added

and \( QL_{it} \) a labour quality index à-la-Hellerstein-Neumark

\[ QL_{it} = \sum_k \mu_{i,j} L_{i,j,t} = \mu_{i,ref} L_{i,t} + \sum_{j \neq ref} (\mu_{i,j} - \mu_{i,ref}) L_{i,j,t} \]

\( \mu_j \) reflecting the productivity of type \( j \) workers (e.g. university)
• Assuming same marginal product across firms, (no subscript $i$) and taking logs $QL$ becomes:

$$\ln QL_{i,t} = \ln \mu_{ref} + \ln L_{i,t} + \ln (1 + \sum_{j \neq ref} (\lambda_j - 1) P_{i,j,t})$$

Where

$$\lambda_j \equiv \mu_j / \mu_{ref}$$

is the relative productivity of type $j$ workers

$$P_{i,j,t} \equiv L_{i,j,t} / L_{i,t}$$

the proportion of type $j$ workers (eg. young, prime age (ref.), old...)


Since $\ln(1+x) \approx x$, we can linearize

$$Ln\ QL_{it} = \ln \mu_{ref} + \ln L_{i,t} + \sum_{j \neq \text{ref}} (\lambda_j - 1) \ P_{i,j,t}$$

And the production function becomes:

$$\ln(Y_{i,t}/L_{i,t}) = \ln A + \alpha \left[ \ln \mu_{ref} + \ln L_{i,t} + \sum_{j \neq \text{ref}} (\lambda_j - 1) \ P_{ijt} \right] + \beta \ln K_{it} - \ln L_{ik}$$

or, equivalently

$$\ln \left( \frac{Y_{it}}{L_{it}} \right) = B + (\alpha - 1) l_{it} + \sum_{j \neq \text{ref}} \eta_j P_{ijt} + \beta k_{it}$$

where:

- $B = \ln A + \alpha \ln \mu_{ref}$
- $\eta_j = \alpha (\lambda_j - 1); \ \lambda_j = \mu_j / \mu_{ref} \quad j \neq \text{ref.}$
- $l_{it} = \ln L_{it}; \ k_{it} = \ln K_{it}$
Equ.2: average labour costs

\[ \frac{W_{it}}{L_{it}} = \sum_j \pi_j \frac{L_{ijt}}{L_{it}} = \pi_{ref} + \sum_{j \neq \text{ref.}} (\pi_j - \pi_{\text{ref}}) \frac{L_{ijt}}{L_{it}} \]

Taking the logarithm and using \( \log(1+x) \approx x \), we can approximate this by:

\[ \ln\left(\frac{W_t}{L_{it}}\right) = B^w + \sum_{k \neq \text{ref}} \eta^W_j P_{i,j,t} \]

where

- \( B^w = \ln \pi_0 \)
- \( \eta^W_j = (\Phi_j - 1) \)
- \( \Phi_j \equiv \frac{\pi_j}{\pi_{\text{ref}}} \quad j \neq \text{ref} \)
Formulating the key hypothesis test is now straightforward

Assuming spot labour markets and cost-minimizing firms the null hypothesis of no impact on the productivity-labour cost ratio for type $j$ worker implies $\eta_j = \eta^w_j$.

Any negative (or positive) difference between these two coefficients can be interpreted as a quantitative measure of the disincentive (incentive) to employ the category of workers considered.
Econometric specification
The hyp. test = easily implemented if one adopts strictly equivalent econometric specifications

\[
\ln \left( \frac{Y_{it}}{L_{it}} \right) = B + (\alpha - 1)l_{it} + \sum_{j \neq \text{ref}} \eta_j P_{itj} + \beta k_{it} + \gamma F_{it} + \epsilon_{it}
\]

\[
\ln \left( \frac{W_{it}}{L_{it}} \right) = B^w + (\alpha^w - 1)l_{it} + \sum_{j \neq \text{ref}} \eta^w_j P_{itj} + \beta^w k_{it} + \gamma^w F_{it} + \epsilon^w_{it}
\]

Taking the difference

\[
\ln (Y_{it}) - \ln (W_{it}) = B^G + \alpha^G l_{it} + \sum_{j \neq \text{ref}} \eta^G_j P_{itj} + \beta^G k_{it} + \gamma^G F_{it} + \epsilon^G_{it}
\]

where:

\[
B^G = B - B^w; \quad \alpha^G = \alpha - \alpha^w ; \eta^G_j = \eta_j - \eta^w_j; \\
\beta^G = \beta - \beta^w ; \gamma^G = \gamma - \gamma^w \quad \text{and} \quad \epsilon^G_{it} = \epsilon_{it} - \epsilon^w_{it}
\]

\[\eta^G_j = \text{direct estimate of null hypothesis of no impact on the productivity-labour cost ratio}\]
The identification problem

\[ \ln \left( \frac{Y_{it}}{L_{it}} \right) = B + \frac{(\alpha - 1)l_{it} + \sum j \neq \text{ref} \eta P_{ijt}}{\varphi q_{it}} + \beta k_{it} + \gamma F_{it} + \varepsilon_{it} \]

with \( \varepsilon_{it} = \Theta_{i} + \tau_{it} + \sigma_{it} \)

\( \Theta_{i} \) unobservable (time-invariant) heterogeneity between firms
\( \tau_{it} \) short-term (asymmetrically) observed productivity shocks
\( \sigma_{it} \) random error \( E(\sigma_{it}) = 0 \)
One can deal with $\theta_i$ by resorting to first differences or firm fixed effects

The biggest challenge= coping with $\tau_{it}$

$\Rightarrow$ two methods:

IV: lagged values $P_{i,j,t-1} ; P_{i,j,t-2}$ as instruments (Aubert and Crépon, 2003, 2007; van Ours & Stoeldraijer, 2011)

Intermediates-as-proxy/more structural approach

ACF uses intermediates/materials to proxy the short-term productivity term

\[ \text{int}_{it} = f(\tau_{it}, k_{it}, q_{it}) \]

Assuming this function is monotonic, it can be inverted

\[ \tau_{it} = f^{-1}(\text{int}_{it}, k_{it}, q_{it}) \]

Leading to

\[ \ln \left( \frac{Y_{it}}{L_{it}} \right) = B + \phi \ q_{it} + \beta \ k_{it} + \gamma F_{it} + \theta_i + f^{-1}(\text{int}_{it}, k_{it}, q_{it}) + \sigma_{it} \]

=> Our specificity it to combine this strategy with fixed effects to eliminate \( \theta_i \) => FE-ACF
<table>
<thead>
<tr>
<th>Year</th>
<th>Mean age (year)</th>
<th>Share of 18-29 (%)</th>
<th>Share of 30-49 (%)</th>
<th>Share of 50-65 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>36.15</td>
<td>48.58%</td>
<td>39.35%</td>
<td>12.08%</td>
</tr>
<tr>
<td>1999</td>
<td>36.43</td>
<td>46.98%</td>
<td>40.37%</td>
<td>12.67%</td>
</tr>
<tr>
<td>2000</td>
<td>36.64</td>
<td>45.84%</td>
<td>40.90%</td>
<td>13.26%</td>
</tr>
<tr>
<td>2001</td>
<td>37.00</td>
<td>44.24%</td>
<td>41.77%</td>
<td>14.00%</td>
</tr>
<tr>
<td>2002</td>
<td>37.37</td>
<td>42.61%</td>
<td>42.76%</td>
<td>14.64%</td>
</tr>
<tr>
<td>2003</td>
<td>37.96</td>
<td>40.64%</td>
<td>43.12%</td>
<td>16.24%</td>
</tr>
<tr>
<td>2004</td>
<td>38.33</td>
<td>39.17%</td>
<td>43.77%</td>
<td>17.06%</td>
</tr>
<tr>
<td>2005</td>
<td>38.72</td>
<td>37.66%</td>
<td>44.43%</td>
<td>17.91%</td>
</tr>
<tr>
<td>2006</td>
<td>39.10</td>
<td>36.33%</td>
<td>44.66%</td>
<td>19.00%</td>
</tr>
</tbody>
</table>
Figure 2 - Average productivity and average labour cost (in log) according to share of old (50-64) workers. Year 2006
<table>
<thead>
<tr>
<th></th>
<th>[1]-OLS</th>
<th>[2]-First Differences</th>
<th>[3]-intermediate inputs ACF$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Productivity ($\eta_3$)</td>
<td>-0.277***</td>
<td>-0.112***</td>
<td>-0.284***</td>
</tr>
<tr>
<td>std error</td>
<td>(0.021)</td>
<td>(0.025)</td>
<td>(0.052)</td>
</tr>
<tr>
<td>Labour Costs ($\eta^{w_3}$)</td>
<td>-0.191***</td>
<td>-0.052***</td>
<td>-0.141***</td>
</tr>
<tr>
<td>std error</td>
<td>(0.012)</td>
<td>(0.013)</td>
<td>(0.010)</td>
</tr>
<tr>
<td>Prod.-Lab. Costs gap ($\eta^{w_3}$)</td>
<td>-0.094***</td>
<td>-0.059**</td>
<td>-0.099**</td>
</tr>
<tr>
<td>std error</td>
<td>(0.018)</td>
<td>(0.023)</td>
<td>(0.045)</td>
</tr>
<tr>
<td>[4]- System GMM (all available data)</td>
<td>[5]- System GMM (same sample as for [6])</td>
<td>[6]- First Differences + intermediate inputs ACF$</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>----------------------------------------</td>
<td>-----------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>-0.194***</td>
<td>-0.274***</td>
<td>-0.220***</td>
<td></td>
</tr>
<tr>
<td>(0.034)</td>
<td>(0.044)</td>
<td>(0.054)</td>
<td></td>
</tr>
<tr>
<td>0.024</td>
<td>0.012</td>
<td>-0.090***</td>
<td></td>
</tr>
<tr>
<td>(0.015)</td>
<td>(0.018)</td>
<td>(0.007)</td>
<td></td>
</tr>
<tr>
<td>-0.230***</td>
<td>-0.289***</td>
<td>-0.127***</td>
<td></td>
</tr>
<tr>
<td>(0.032)</td>
<td>(0.043)</td>
<td>(0.021)</td>
<td></td>
</tr>
</tbody>
</table>
### Robustness checks

<table>
<thead>
<tr>
<th>Overall, unbalanced panel (ref.)</th>
<th>Balanced panel</th>
<th>Controlling for cohort effects</th>
<th>Excluding financial, real estate, utilities and non-profit activities</th>
<th>Firms in 10-90th perc. size bracket</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>[4]- System GMM</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Productivity ($\eta_3$)</td>
<td>-0.194***</td>
<td>-0.182***</td>
<td>-0.394***</td>
<td>-0.176***</td>
</tr>
<tr>
<td><em>std error</em></td>
<td>(0.034)</td>
<td>(0.033)</td>
<td>(0.035)</td>
<td>(0.034)</td>
</tr>
<tr>
<td>Prod.-Lab. Costs ratio ($\eta_3^G$)</td>
<td>-0.230***</td>
<td>-0.212***</td>
<td>-0.218***</td>
<td>-0.318***</td>
</tr>
<tr>
<td><em>std error</em></td>
<td>(0.032)</td>
<td>(0.032)</td>
<td>(0.033)</td>
<td>(0.032)</td>
</tr>
<tr>
<td>#obs</td>
<td>77,069</td>
<td>77,069</td>
<td>77,069</td>
<td>75,380</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>69,801</td>
</tr>
<tr>
<td><strong>Controls</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- All data are deviations from region+ year interacted with NACE2 industry means. See appendix for NACE2 classification of industries</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Capital, number of employees, hours worked per employee, share of blue-collar workers, share of managers + firm fixed effect</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Instr. indentifying endog. labour inputs</strong></td>
<td>$L_2$ (Log of labour, Share of workers aged 18-29, Share of workers aged 50-64)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| [6]- First Differences + intermediate inputs ACF | | | | | |
|-------------------------------------------------|----------------|-------------------------------|---------------------------------------------------------------|----------------------------------|
| Productivity ($\eta_3$)                        | -0.220***      | -0.376***                     | -0.207***                                                    | -0.285***                        |
| *std error*                                     | (0.054)        | (0.000)                       | (0.064)                                                      | (0.053)                          |
| Prod.-Lab. Costs ratio ($\eta_3^G$)            | -0.127***      | -0.146***                     | -0.100**                                                     | -0.164***                        |
| *std error*                                     | (0.021)        | (0.023)                       | (0.057)                                                      | (0.023)                          |

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### Table 5a - Parameter estimates (standard errors). Older (50-64) workers productivity ($\eta_3$) and productivity-labour cost gap ($\eta^G_3$). TRAINING COSTS

<table>
<thead>
<tr>
<th></th>
<th>All available data Overall unbalanced panel</th>
<th>Firms reporting positive training spending (ref.) (A)</th>
<th>Firms reporting training spending equal or above 2% of the overall annual payroll cost (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Productivity per head. ($\eta_3$)</strong></td>
<td>-0.194*** (0.034)</td>
<td>-0.238*** (0.043)</td>
<td>-0.252*** (0.049)</td>
</tr>
<tr>
<td><strong>Productivity-labour cost gap ($\eta^G_3$)</strong></td>
<td>-0.230*** (0.032)</td>
<td>-0.255*** (0.044)</td>
<td>-0.254*** (0.049)</td>
</tr>
<tr>
<td><strong>#obs</strong></td>
<td>77,069</td>
<td>49,230</td>
<td>37,590</td>
</tr>
</tbody>
</table>

### [4]- System GMM

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Productivity per head. ($\eta_3$)</strong></td>
<td>-0.220*** (-0.054)</td>
<td>-0.496*** (0.043)</td>
</tr>
<tr>
<td><strong>Productivity-labour cost gap ($\eta^G_3$)</strong></td>
<td>-0.127*** (-0.021)</td>
<td>-0.263*** (0.031)</td>
</tr>
<tr>
<td><strong>#obs</strong></td>
<td>38,944</td>
<td>23,217</td>
</tr>
</tbody>
</table>

### [6]- First differences + intermediate goods ACF$^S$

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tr>
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<tr>
<td><strong>Productivity-labour cost gap ($\eta^G_3$)</strong></td>
<td>-0.127*** (-0.021)</td>
<td>-0.263*** (0.031)</td>
</tr>
<tr>
<td><strong>#obs</strong></td>
<td>38,944</td>
<td>23,217</td>
</tr>
</tbody>
</table>

*** p<0.01, ** p<0.05, * p<0.1