Does Training Favour Employment in Belgium?

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1. Introduction

Recent years: growing importance of education and lifelong learning

Well documented relations:

- **Labour training and higher firm's performance** through increased labour productivity, lower turnover, higher innovation and market power, attracting and retaining more qualified workers

BUT...

- **Labour training increases labour costs** (through formal and shadow training costs and wage determination)

1. Introduction

Becker (1964): Firms will not pay for general training because workers will reap all of its benefits

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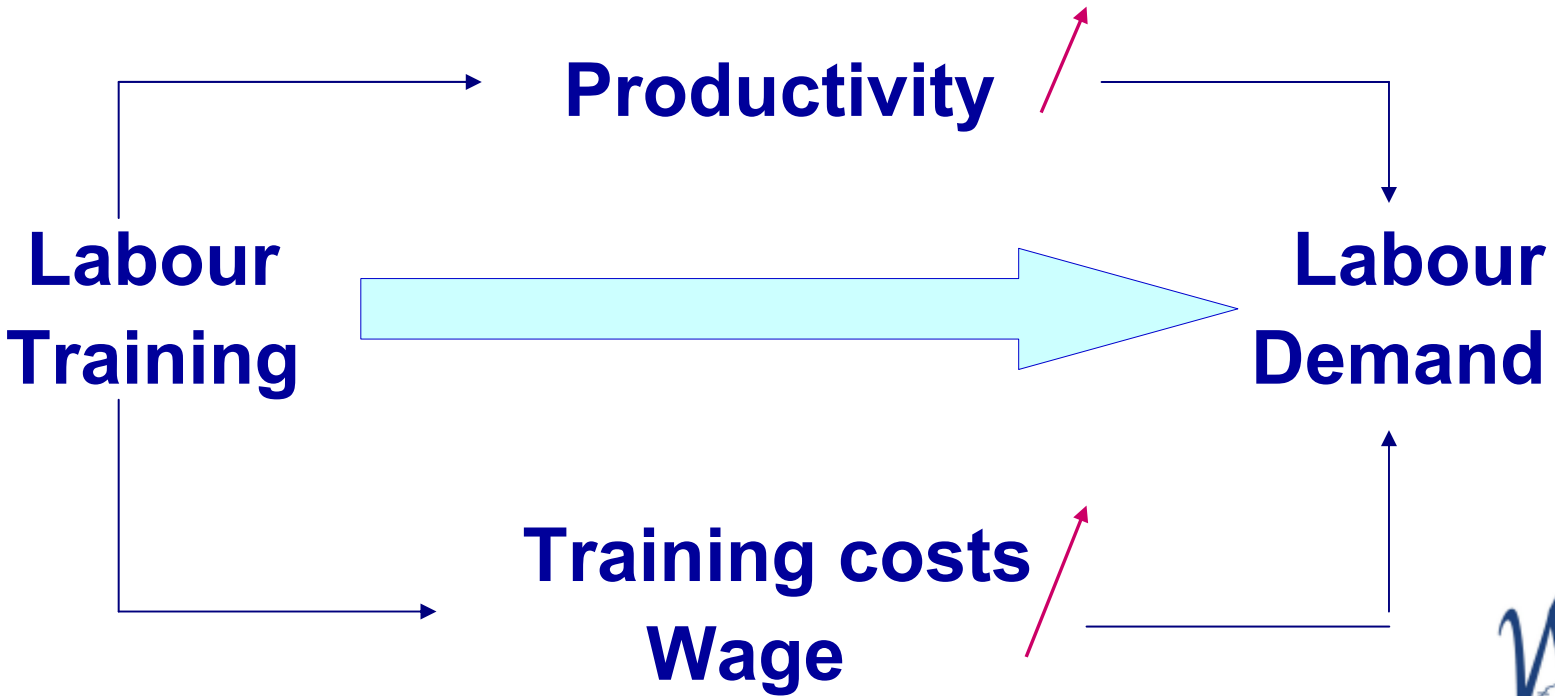
Acemoglu and Pischke (1999): "wage compression hypothesis": general training can be financed by firms because additional productivity is not thoroughly compensated by higher wages

1. Introduction

In this contribution : firm labour training → labour demand?



2. The Model

i) Assumptions

- **Maximising profit** firms, short term, predetermined capital stock:

$$Max\,\pi_{ijt} = p_{ijt} \cdot Q_{ijt} - w_{ijt} \cdot L_{ijt} - CF_{ijt}$$

- **Monopolistic** competition regime:

$$\frac{Q_{ijt}}{y_{jt}} = \left(\frac{p_{ijt}}{p_{jt}} \right)^{-\eta}$$

2. The Model

i) Assumptions

- **Cobb Douglas** production function with homogeneous labour extended to include training effects on labour productivity:

$$Q_{ijt} = A_{ijt} \cdot \left(L_{ijt} \cdot \frac{T_{ijt}}{L_{ijt}}^{\lambda_1} \cdot \frac{CF_{ijt}}{T_{ijt}}^{\lambda_2} \cdot \frac{T_{ijt-1}}{L_{ijt-1}}^{\delta_1} \cdot \frac{CF_{ijt-1}}{T_{ijt-1}}^{\delta_2} \right)^{\alpha}$$

2. The Model

i) Assumptions

- **Wage determination** by the outside option with rent sharing and training effect through human capital potential wage pressure:

$$\ln w_{ijt} = \beta_0 + \beta_1 \cdot \ln U_{jt} + \beta_2 \cdot \ln w^0_{jt} + \beta_3 \cdot \ln\left(\frac{\pi}{L}\right)_{ijt-1} + \beta_4 \cdot \ln\left(\frac{\pi}{L}\right)_{ijt-2} + \beta_5 \cdot \ln\left(\frac{\pi}{L}\right)_{ijt-3}$$
$$+ \beta_6 \cdot \ln\frac{CF_{ijt}}{T_{ijt}} + \beta_7 \cdot \ln\frac{T_{ijt}}{L_{ijt}} + \beta_8 \cdot \ln\frac{CF_{ijt-1}}{T_{ijt-1}} + \beta_9 \cdot \ln\frac{T_{ijt-1}}{L_{ijt-1}}$$

2. The Model

ii) Labour Demand Specification

- Maximising profit objective function:

$$Max\pi_{ijt} = p_{jt} \cdot \left(\frac{Q_{ijt}}{y_{jt}} \right)^{-\frac{1}{\eta}} \cdot A_{ijt} \cdot \left(L_{ijt} \cdot \frac{T_{ijt}}{L_{ijt}}^{\lambda_1} \cdot \frac{CF_{ijt}}{T_{ijt}}^{\lambda_2} \cdot \frac{T_{ijt-1}}{L_{ijt-1}}^{\delta_1} \cdot \frac{CF_{ijt-1}}{T_{ijt-1}}^{\delta_2} \right)^{\alpha} - w_{ijt} \cdot L_{ijt} - \frac{CF_{ijt}}{T_{ijt}} \cdot \frac{T_{ijt}}{L_{ijt}} \cdot L_{ijt}$$

- FOC and rearranging terms → Log of labour demand w.r.t. logs of different variables of interest:

2. The Model

ii) Labour Demand Specification

$$\ln L_{ijt} = -\frac{1-\frac{1}{\eta}}{\alpha-1-\frac{\alpha}{\eta}}\cdot\ln A_{ijt} - \frac{1}{\alpha-1-\frac{\alpha}{\eta}}\cdot\ln\alpha - \frac{1}{\alpha-1-\frac{\alpha}{\eta}}\cdot\ln\left(1-\frac{1}{\eta}\right) + \frac{1}{\alpha-1-\frac{\alpha}{\eta}}\cdot\beta_0 - \frac{1}{\alpha-1-\frac{\alpha}{\eta}}\cdot\ln p_{jt} - \frac{1-\frac{1}{\eta}}{\alpha-1-\frac{\alpha}{\eta}}\cdot\ln y_{jt}$$

$$+\left(\frac{1}{\alpha-1-\frac{\alpha}{\eta}}\cdot\beta_7' - \frac{\alpha-\frac{\alpha}{\eta}}{\alpha-1-\frac{\alpha}{\eta}}\cdot\lambda_1\right)\ln\frac{T_{ijt}}{L_{ijt}} + \left(\frac{1}{\alpha-1-\frac{\alpha}{\eta}}\cdot\beta_6' - \frac{\alpha-\frac{\alpha}{\eta}}{\alpha-1-\frac{\alpha}{\eta}}\cdot\lambda_2\right)\ln\frac{CF_{ijt}}{T_{ijt}} + \left(\frac{1}{\alpha-1-\frac{\alpha}{\eta}}\cdot\beta_9 - \frac{\alpha-\frac{\alpha}{\eta}}{\alpha-1-\frac{\alpha}{\eta}}\cdot\delta_1\right)\ln\frac{T_{ijt-1}}{L_{ijt-1}}$$

$$+\left(\frac{1}{\alpha-1-\frac{\alpha}{\eta}}\cdot\beta_8 - \frac{\alpha-\frac{\alpha}{\eta}}{\alpha-1-\frac{\alpha}{\eta}}\cdot\delta_2\right)\ln\frac{CF_{ijt-1}}{T_{ijt-1}} + \frac{1}{\alpha-1-\frac{\alpha}{\eta}}\cdot\beta_1\cdot\ln U_{jt} + \frac{1}{\alpha-1-\frac{\alpha}{\eta}}\cdot\beta_2\cdot\ln w_{jt}^{0} + \frac{1}{\alpha-1-\frac{\alpha}{\eta}}\cdot\beta_3\cdot\ln\left(\frac{\pi}{L}\right)_{ijt-1}$$

$$+\frac{1}{\alpha-1-\frac{\alpha}{\eta}}\cdot\beta_4\cdot\ln\left(\frac{\pi}{L}\right)_{ijt-2} + \frac{1}{\alpha-1-\frac{\alpha}{\eta}}\cdot\beta_5\cdot\ln\left(\frac{\pi}{L}\right)_{ijt-3}$$

2. The Model

ii) Labour Demand Specification

- From the estimation point of view, we specify the following relation:

$$\ln L_{ijt} = \gamma_0 + \gamma_1 \ln p_{jt} + \gamma_2 \ln y_{jt} + \gamma_3 \ln \frac{T}{L}_{ijt} + \gamma_4 \ln \frac{CF}{T}_{ijt} + \gamma_5 \ln \frac{T}{L}_{ijt-1} + \gamma_6 \ln \frac{CF}{T}_{ijt-1} + \gamma_7 \ln U_{jt}$$

$$\oplus \quad \oplus \quad ? \quad ? \quad ? \quad ? \quad \oplus$$

$$+ \gamma_8 \ln \overset{\circ}{w}_{jt} + \gamma_9 \ln \left(\frac{\pi}{L}\right)_{ijt-1} + \gamma_{10} \ln \left(\frac{\pi}{L}\right)_{ijt-2} + \gamma_{11} \ln \left(\frac{\pi}{L}\right)_{ijt-3}$$

$$- \quad - \quad - \quad -$$

2. The Model

ii) Labour Demand Specification

- Effect of training variables:

$$\frac{d \ln L_{ijt}}{d \ln \frac{CF_{ijt}}{T_{ijt}}} = -\left(\frac{\alpha - \frac{\alpha}{\eta}}{\alpha - 1 - \frac{\alpha}{\eta}} \right) \cdot \lambda_2 + \left(\frac{1}{\alpha - 1 - \frac{\alpha}{\eta}} \right) \cdot \beta_6'$$

→ ***Right hand side, 1st term (positive)***

>0 productivity effect on labour demand through training

→ ***Right hand side, 2nd term (negative)***

<0 cost effect on labour demand through direct cost and wage

2. The Model

ii) Labour Demand Specification

$$\ln L_{ijt} = \gamma_0 + \gamma_1 \ln p_{jt} + \gamma_2 \ln y_{jt} + \gamma_3 \ln \frac{T_{ijt}}{L_{ijt}} + \gamma_4 \ln \frac{CF_{ijt}}{T_{ijt}} + \gamma_5 \ln \frac{T_{ijt-1}}{L_{ijt-1}} + \gamma_6 \ln \frac{CF_{ijt-1}}{T_{ijt-1}} + \gamma_7 \ln U_{jt}$$

$$\oplus \quad \oplus \quad ? \quad ? \quad ? \quad ? \quad \oplus$$

$$+ \gamma_8 \ln \overset{\circ}{w}_{jt} + \gamma_9 \ln \left(\frac{\pi}{L}\right)_{ijt-1} + \gamma_{10} \ln \left(\frac{\pi}{L}\right)_{ijt-2} + \gamma_{11} \ln \left(\frac{\pi}{L}\right)_{ijt-3}$$

$$- \quad - \quad - \quad -$$

3. Dataset

Panel of **269 firms** employing at least 100 workers for the period **1998-2004** from the Belgian Belfirst dataset (annual financial statement and social report)

Descriptive statistics

- An average and constant number of 700 workers by firm
- A high and increasing average productivity
- A rather constant proportion of trained workers of 65%
- A rather constant cost of training of 1420€/worker

4. Results

GMM estimation:

$$\ln L_{ijt} = -0.0077 + 1.3048^{***} \ln p_{jt} + 0.9338^{*} \ln y_{jt} + 0.0393 \ln \frac{T_{ijt}}{L_{ijt}} - 0.0752 \ln \frac{CF_{ijt}}{T_{ijt}} - 0.0371 \ln \frac{T_{ijt-1}}{L_{ijt-1}}$$

$$(0.0099) \quad (0.5409) \quad (0.7553) \quad (0.1875) \quad (0.1385) \quad (0.0594)$$

$$- 0.0032 \ln \frac{CF_{ijt-1}}{T_{ijt-1}} - 0.1056 \ln \left(\frac{\pi}{L} \right)_{ijt-1} - 0.0721^{**} \ln \left(\frac{\pi}{L} \right)_{ijt-2} - 0.0437^{**} \ln \left(\frac{\pi}{L} \right)_{ijt-3}$$

$$(0.0213) \quad (0.1215) \quad (0.0354) \quad (0.0199)$$

***, **, *: *significant at 1%, 5% or 10% level*

4. Results

- >0 and significant effects for the elasticity of labour demand w.r.t. industry output (0,934) and industry output price (1,305)
- <0 and significant labour demand elasticities w.r.t. profit per employee, at two (-0.072) or three (-0,044) lags
- **Alternate in sign and non significant effects from the training variables on labour demand**

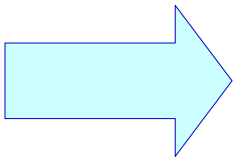
4. Results

We can also estimate:

- A very important and significant product market power (low absolute elasticity of product demand with respect to prices : η =1,397)
- A rather important and significant elasticity of output w.r.t. labour input (α = 0,822)
- Mostly significant and positive elasticities of wages w.r.t. profit per head (0,03 to 0,06)

5. Main Conclusion

Non significant effects of training variables on labour demand



positive productivity effect and negative cost effects seem to offset each other

5. Main Conclusion

2 scenarios not mutually exclusive

1. Trained workers extract ex post the difference between the productivity gain and direct training costs

⇨ Firms don't increase labour demand

2. Training enables firms to develop or reinforce the wedge between productivity and wage

⇨ Important return to training but without increasing labour demand

5. Main Conclusion

Subsidiary training could favour employment if:

1. firms convert additional productivity in employment and not in increased productivity – wage mark-up
2. workers don't claim for higher wages as a result of additional productivity