

# Firm productivity, workforce age and vocational training in Austria



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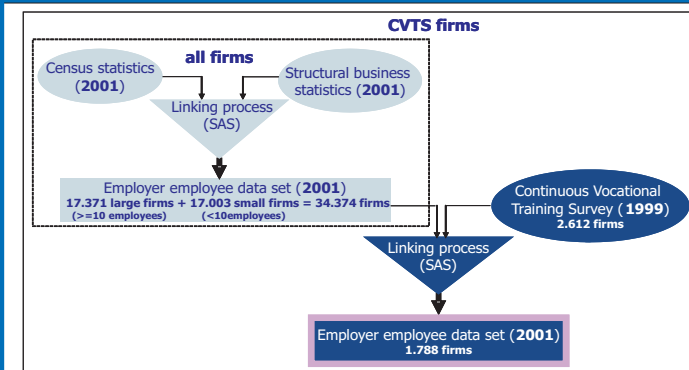
Bernhard Mahlberg



## Motivation

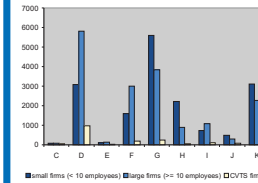
In most industrialised countries, the economic output will be achieved by a **smaller** and **older** labour force in the future. This development is accompanied by the change in the **quantity** and **composition** of human capital. From a firm level point of view (mesolevel), human capital investment/upgrading is less common for the older work force due to lower learning capabilities and less time till retirement. The literature has so far concentrated on the effect of workforce ageing on productivity as well as the effect of continuing vocational training (CVT) on productivity separately. Our focus is on the effect of workforce ageing **and** CVT on productivity controlling for firm-specific characteristics.

## Data

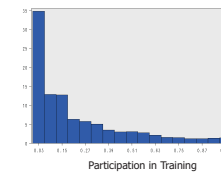


## Descriptive Statistics

### Distribution of firms across sectors



### Training Intensity within firms



### NACE-categories

- C mining
- D manufacturing
- E energy/ water supply
- F construction
- G trade
- H hotel business
- I transport/ information
- J financial services
- K consulting etc.

Selected variables	small firms (< 10 employees)	large firms (>= 10 employees)	CVTS firms
Productivity (value added per worker)	53,72	52,40	54,86
Young (share of employees)	0,21	0,32	0,28
Middle (share of employees)	0,58	0,54	0,56
Old (share of employees)	0,21	0,15	0,16
Male (share of employees)	0,56	0,66	0,68
Female (share of employees)	0,43	0,34	0,33
Employees (total number on average)	3,75	88,63	209,81
Age (of firm on average)	12,97	18,57	23,78
Multiplant (dummy)	0,08	0,32	0,46
Self-employed (share of employees)	0,39	0,03	0,01
Investments (in fixed assets per worker)	22,47	12,20	9,52
NACE D (dummy)	0,18	0,33	0,55
NACE G (dummy)	0,33	0,22	0,13

## Methodology

$$L^* = \sum_{k=1}^K \lambda_k L_k = \lambda_0 L + \sum_{k=1}^K (\lambda_k - \lambda_0) L_k = L \lambda_0 \left( 1 + \sum_{k=1}^K \left( \frac{\lambda_k}{\lambda_0} - 1 \right) \frac{L_k}{L} \right)$$

$$\log(L^*) = \log(L) + \log(\lambda_0) + \sum_{k=1}^K \gamma_k W_k$$

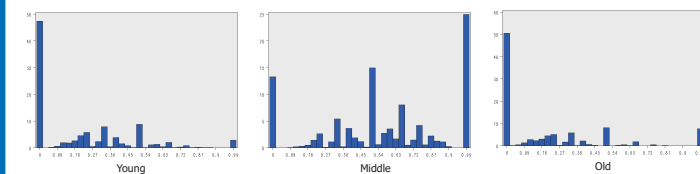
$$\log(v_i) = \text{const.} + \sum_{k=1}^K \gamma_{ki} W_{ki} + X_i + \varepsilon_i$$

$$\log(v_i) = \text{const.} + \sum_{k=1}^K \gamma_{ki} W_{ki} + X_i + T_i + \varepsilon_i$$

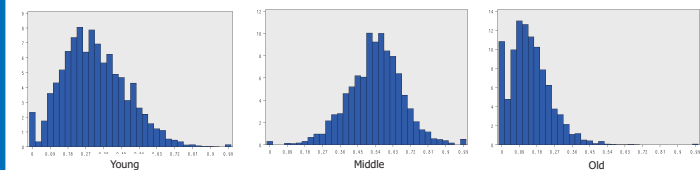
L... sum of labour input  
 $\lambda_0$ ... reference productivity of workers  
 $(L_k/L) = W_k$ ... share of workers of type k  
 $\gamma_k = (\lambda_k/\lambda_0) - 1$   
 $v_i$ ... labour productivity at firm level  
 $T_i$ ... Training  
 $X_i$ ... firm-specific characteristics

## Descriptive Statistics: Age distribution

### Small firms (< 10 employees)

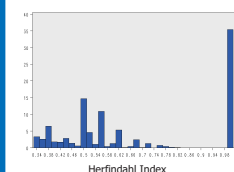


### Large firms (>= 10 employees)

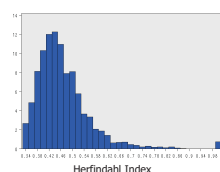


### Degree of Concentration

#### small firms



#### large firms



#### CVTS firms

The age distribution for the CVTS firms is very similar to those of the large firms.

#### Age Groups

- 15 yrs <= young <= 29 yrs
- 30 yrs <= middle <= 49 yrs
- 50 yrs <= old

## Regression Analysis

Number of observations	34.374	17.003	17.371	1.788
Adjusted R <sup>2</sup>	0,29	0,25	0,26	0,35
Dependent variable	log(productivity)	log(productivity)	log(productivity)	log(productivity)
Selected variables	all firms	small firms	large firms	CVTS firms
Age				
young	-0,22***	-0,14***	-0,42***	-0,23
middle (reference categorie)				
old	-0,16***	-0,19***	-0,11*	-0,02
concentration	-0,40***	-0,54***	-0,19***	0,07
Training (1999)				
participation in Training	-	-	-	0,08
Education				
tertiary	0,35***	0,26***	0,79***	0,96***
upper secondary	0,28***	0,21***	0,63***	0,90***
lower secondary	0,10***	0,07**	0,25**	0,45***
primary (reference categorie)				
Sector				
Nace C	0,45***	0,57***	0,37***	0,30***
Nace E	0,60***	0,53***	0,55***	0,53***
Nace F	0,12***	0,25***	0,06***	-0,03
Nace G	-0,14***	-0,10***	-0,13***	-0,23***
Nace H	-0,15***	-0,11***	-0,17***	-0,15**
Nace I	-0,19***	-0,25***	-0,14***	-0,08
Nace J	0,03	-0,14***	0,34***	0,47***
Nace K	-0,09***	-0,07**	-0,08***	0,04

Note: \*\*\* significant on 1%-level, \*\* significant on 5%-level, \* significant on 10%-level

## Main Results

- \* We find, that independent of firm size firms with a higher share of younger or older workers (as compared to middle aged workers) and with a higher concentration of the age structure of its employees are associated with lower productivity.
- \* For the reduced CVTS sample we cannot discern any relation between the age structure/ age concentration and firm productivity.
- \* The educational structure of the workforce is a robust determinant of firm productivity.
- \* We cannot find any significant influence of training on productivity once we control for the sectoral affiliation of firms.

## Outlook

- \* The cross-sectional set-up of our data does not allow us to control for selectivity and endogeneity.  
 --> In collaboration with Statistics Austria we plan to build up a panel of employer-employee data starting in 2001.

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