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Institute for Employment
Research

The Research Institute of the
Federal Employment Agency

IAB

Do organizations benefit or suffer from cultural and age diversity?

"Increasing Heterogeneity and its Impact"

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Outline

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- Theory
- Contribution to the literature
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- Estimation approach
- Diversity measures
- Results

Motivation

- Significant changes in workforce composition
- Demographic change
  - age structure changes, e.g. share of people >65 years will increase from 20% to 34% in 2060 (German Federal Statistical Office 2011)
- International mobility of labour
  - Annual net immigration of 100.000 people is assumed for the future
  - More than 2 million foreign workers in Germany, 140,000 high-skilled foreigners (7.3% of all employees)

→ Effects of workforce composition on economic performance?

Trade-off – costs and benefits of diversity (Lazear 1999, 2000)

- Benefits due to complementarities among different skills and ideas that are specific for certain groups of workers
- Costs caused e.g. by barriers to communication and conflicts
- Production function (Ottaviano and Peri 2005):

$$Y_i = A(C_Y^i)^{1-\alpha}[1-\tau(div_i)]^{\alpha}\sum_{j=1}^{J}(L_{j,Y}^i)^{\alpha},\ \ \tau(div_i)\in(0,1)$$

Contribution of the paper

- Evidence on the impact of worker diversity on firm productivity in Germany
- In contrast to others the impact of different dimension of staff diversity (age, and cultural background) is considered simultaneously
- Choosing different diversity measures to disentangle positive and negative effects of diversity
- Deal with unobserved heterogeneity and endogeneity

Data

Sources

- **IAB Establishment Panel**, survey (~ 1% of all plants)
  → information on value added, capital stock, …
- **Establishment History Panel**
  → information on industry, region of location, firm´s age and size, …
- **Process-produced individual data** from the IAB
  → detailed information on composition of a firm´s workforce

Dataset

- unbalanced panel: ~ 2,800 German plants, 1996-2008 (~ 20,000 obs.)
- only firms with at least 3 employees
- exclusion of firms with less than 5 observations
- the whole public sector and NGOs are excluded

Estimation approach: Cobb-Douglas Production function

$$\ln(Y_{it}) = \ln(A_{it-1}) + \alpha_1 \ln(L_{it-1}) + \alpha_2 \ln(C_{it-1}) + \varepsilon_{it}$$

$$= \alpha_1 \ln(L_{it-1}) + \alpha_2 \ln(C_{it-1}) + \sum_{j=1}^{J} \beta_j DIV_{jit-1}^{Culture} + \sum_{k=1}^{K} \gamma_k DIV_{kit-1}^{Age} + \sum_{l=1}^{L} \delta_l Z_{lit-1} + \mu_i + d_t + d_{mt} + \varepsilon_{it}$$

with $$\ln(A_{it-1}) = \sum_{j=1}^{J} \beta_j DIV_{jit-1}^{Culture} + \sum_{k=1}^{K} \gamma_k DIV_{kit-1}^{Age} + \sum_{l=1}^{L} \delta_l Z_{lit-1} + \mu_i + d_t + d_{mt}$$

- **Y** : value added
- **A** : total factor productivity
- **L** : labor
- **C** : capital
- **$DIV^{Culture}$** : cultural diversity
- **DIV^{Age}** : age diversity
- **Z** : control variables (skill structure, …)
- **μ_i** : firm level fixed effects
- **d_t** : year fixed effect
- **d_{mt}** : year-industry fixed effects

IV-Estimation

- External instruments: diversity of “identical” firms that are not part of our dataset (< 1 % of all firms are included in our dataset)
- Identification of “identical” firms, 1:1 matching
  - location (east / west & region type: 6 categories)
  - industry (37 categories)
  - firm age (5 categories)
  - firm size (9 categories)
  - share high-skilled worker (4 categories)
  - share low-skilled worker (4 categories)
- Calculation of external instruments, example:

$$\overline{DIV}_{it}^{Cult} = \sum_{j \in S_i} DIV_{jt}^{Cult} \; / \; J$$

(For 11 % of the observations it is not possible to identify at least one “identical” observation.)

set of all firms that are not part of our dataset but have identical properties as firm *i*

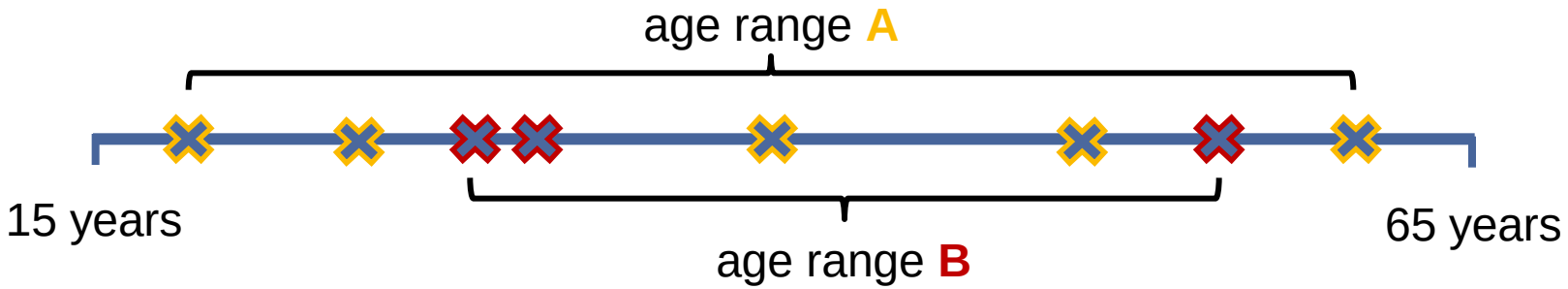
- Lagged diversity measures (referring to t-3)

Cultural diversity

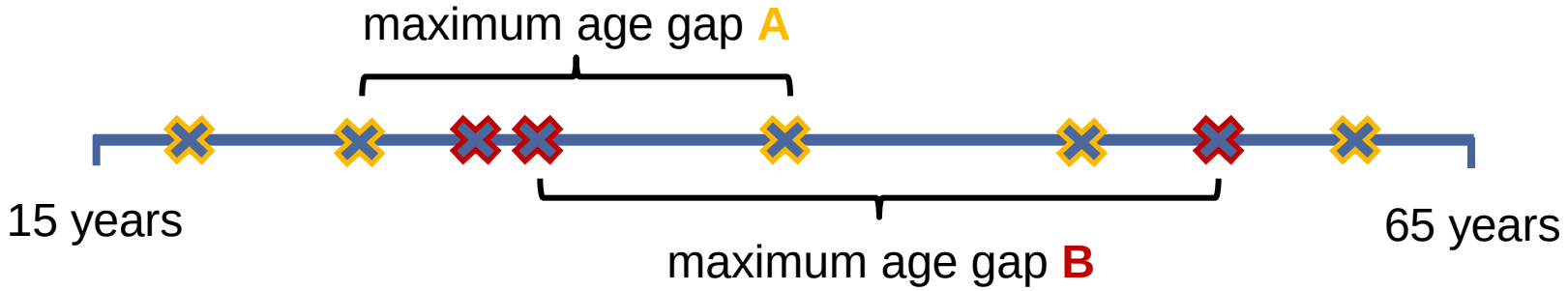
- **Number of cultural cluster** within a firm as proxy variable for amount of cultural specific knowledge and abilities (Dawson 2007)
  - Cluster based on GLOBE-Cluster (Global Leadership and Organizational Behavior Effectiveness Research Project; House et al. 2004)
  - 13 different cluster:
    Germany; German-speaking Europe & Benelux;
    Northern Europe; Latin Europe (France, Italy, Spain, …);
    Eastern Europe; South-east Europe;
    Anglo Cluster (US, UK, Australia, …); Latin America;
    Middle East; Sub-Saharan Africa;
    Confucian Asia; South Asia;
    Rest of the World
- **Share of foreign workers**

Age diversity (Dawson 2007)

- **Age range** reflecting the amount of age-specific knowledge and abilities (new technical knowledge vs. work experience)



- **Maximum age gap** as an indicator for communication barriers, misunderstandings and conflicts between younger and older workers



Results, dep. variable: Value-added

N=17,637 (2,526 firms)	FE	FE-IV (2SLS)	RE	RE-IV (2SLS)	1st stage F stat. (FE-IV)
Number cult. cluster	0.021*	0.009	0.048***	0.094	20.14
Share foreign worker	0.020	-0.274	0.103	0.177	11.08
Age range	-0.002	-0.007	-0.003*	0.001	16.48
Maximum age gap	0.001	0.023	0.001	-0.012	10.55
Within R^2	0.079				
Between R^2			0.889		
Hausman Test (p-value)	0.000				
Hansen J-Stat. (p-value)		0.593			
Overidentification test (p-value)		0.000			

+ p<0,1; * p<0,05; ** p<0,01, p-values are based on robust standard errors (except for RE-IV).
control variables: ln(labour), ln(capital), share high-skilled, share female, mean(age), time fixed effects, dummy variables for year x industry

Findings

- FE & RE model indicates that:
  - age diversity does (not) affect firm productivity
  - cultural diversity matters: lager amount of cultural specific knowledge / abilities has a positive effect on firm productivity

- **but**: IV estimation do not confirm the significant impact of cultural diversity on firm productivity

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Thank you very much for your attention!

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Results, dep. variable: Value-added, alternative diversity measures

N=17,637 (2,526 firms)	FE	FE
Number cult. cluster	0.029*	
Blau-Index (HHI) for cult. cluster	0.020	0.028
Share foreign worker		0.138
Age range	-0.001	
Av. distance between age_i & age_j	-0.001	
SD (age)		-0.025
Var (age)		0.001
Within R^2	0.079	0.079

$$Blau = 1 - \sum_{c=1}^{12} \left(\frac{foreign_c}{foreign} \right)^2$$

$$D_{Sdist} = \frac{2}{N(N-1)} \sum_{i=1}^{N} \sum_{j<i} (age_i - age_j)$$

+ p<0,1; * p<0,05; ** p<0,01, p-values are based on robust standard errors.
control variables: ln(labour), ln(capital), share high-skilled, share female, mean(age), time fixed effects, dummy variables for year x industry

Results, dep. variable: Value-added

Only small firms (≤ 20 emp.) N=7,574 (1,082 firms)	FE	RE	FE-IV
Number cult. cluster	0.044	0.087*	0.224
Share foreign worker	0.147	0.069	-0.651
Age range	-0.002	-0.002	-0.006
Maximum age gap	0.001	0.000	0.023
Within R^2	0.070		
Between R^2		0.506	
Hausman Test (p-value)	0.000		
Hansen J-Stat. (p-value)			0.839
Overidentification test (p-value)			0.000

$^{+}$ p<0,1; * p<0,05; ** p<0,01, p-values are based on robust standard errors.
control variables: ln(labour), ln(capital), share high-skilled, share female, mean(age), time fixed effects, dummy variables for year x industry

similar observations

Percentiles		Smallest		
1%	1	1		
5%	1	1		
10%	2	1	Obs	20365
25%	8	1	Sum of Wgt.	20365
50%	44		Mean	1151.413
		Largest	Std. Dev.	3794.391
75%	355	33539		
90%	2393	33539	Variance	1.44e+07
95%	6713	33539	Skewness	5.177931
99%	21356	33539	Kurtosis	33.22158

Inter- and intra-class standard deviation of diversity measures, class = group of "identical" firms

		Standard Deviation	
		Inter-class SD	Intra-class SD
Culture	Number cult. cluster	1.975	0.029
	Blau-Index	0.223	0.004
	Share foreign worker	0.057	0.002
AGE	Range	9.088	0.108
	Max distance	3.624	0.068
	Av. distance	1.066	0.053
	SD	1.274	0.040

Statistics are based on 492,922 observations (year=2007):
1,695 groups of "identical" firms & on average 291 observations per group