Does Labour Diversity Affect Firm Performance?

VERY PRELIMINARY, PLEASE DON'T QUOTE

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Introduction

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- In a **globalized world**, firms are **challenged** by constantly changing demand for goods and services and on a constant pressure to meet the new needs.
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- The European Commission study "The Business Case for Diversity; Good Practices in the Workplace", argued that **the promotion of diversity** within all areas of business activity can bring companies **substantial** operational and financial **benefits**. case_study
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Case Studies

(1) **Novartis** -Switzerland- "Diversity and Inclusion Advisory Council"

(2) **Accenture** -UK- "Minority Leadership Development Programme"

(3) **Dublin Bus** -Ireland- "Say no to Ageism"

(4) **Hewlett Packard** -Spain- "Latex Printing Technology"

(5) **Novo Nordisk** -Denmark- "KPI on diversity"

Back

Literature

- The **theory** suggests that workforce diversity may affect firm performance and internationalization through **various channels** (Lazear, 1999; Alesina and La Ferrara, 2005; Osborne, 2000).
- The **empirical evidence** concerning diversity and economic performance has been fairly **scarce** $\Rightarrow$ most of the previous studies were based on **case studies** (Hamilton et al. 2003, 2004; Kurtulus, 2009) or on aggregate **regional** data (Ottaviano and Peri, 2005; Alesina and La Ferrara, 2005).
- **Firm level** studies are based on cross-sectional data (Barrington and Troske, 2001) or on rather restrictive definitions of employee diversity (Navon 2009; Grund and Westergaard-Nielsen, 2008a, 2008b).
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Motivation

- In this paper we add **to the empirical evidence** by analyzing the relationship between **three dimensions** of diversity on firm performance using comprehensive register-based linked employer-employee dataset.
- In addition, we look at **several measures** of firm performance: firm productivity, firm innovation and firm internationalization process.

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This paper

- **evaluates** the effects of diversity in nationality, skills and demographics on firm performance, using a complex and useful index of diversity borrowed from **biology**;
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Data sources

- Integrated Database for Labor Market Research **IDA** (1995-2005);
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Diversity Index

- Employees diversity is **quantified** using information regarding their gender, age, whether the employee has any children, work experience, highest fulfilled education and nationality.
- We use the exponential of **Shannon-Weaver entropy** index to indicate the degree of diversity at the firm level:

$$index\_h_{it} = exp(-\sum_{s=1}^{H} p_{sit}(lnp_{sit})),$$

- When the firm is **multi-establishment**, we sum the entropy indexes calculated for each establishment belonging to the same firm, **weighting** for the number of employees employed in each workplace;

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Dimensions of diversity

1. **Cultural** diversity is represented by the **employee nationality** and it is based on the following categories: Danish, North America and Oceania, Central and South America, Africa, West and South Europe, Formerly Communist Countries, Asia, East Asia and Muslim Countries.
2. **Skill** diversity is based on the combination of the **highest educational level** and the quartiles of the **work experience**.
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Productivity estimation

- Production function estimation in panel data setting for **each** 2-digit sector separately:

$$ln(Y_{it}) = cons + \mathrm{a}ln(L_{it}) + \mathrm{b}ln(K_{it}) + \omega_{it} + u_{it}$$

- **parametric** (OLS) and **semi-parametric** approach (Levinsohn Petrin, 2003).
- We define the log of measured TFP of firm i at time t for each industry j, denoted by TFP_{ijt}, as

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The impact of diversity on productivity

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- where γ_1, γ_2 and γ_3 are respectively the **labor diversity effects** associated with employees' diversity in terms of nationality, skill and demographic characteristics; $Z_i t$ are firm specific characteristics; γ_t, γ_r and γ_j are time, regional, and industry controls.

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Instrumental variable approach

- To cope with potential simultaneity and endogeneity issues, we decide to follow an **instrumental variable** approach.
- Specifically, we consider two instrumental variable **strategies**:
  1. diversity measured at **county level** (**validity** based on low residential mobility rates in Denmark, Filges and Deding, 2009);
  2. the second and the third lag of the firm labor diversity indexes.

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County level diversity

Indexes	Mean	Median	Min	Max	Sd
		Copenhagen County			
Index_fore	1.201	1	1	6.332	0.204
Index_skill	2.205	1.906	1	14.003	1.998
Index_demo	2.601	2	1	12.403	1.738
		Frederiksborg County			
Index_fore	1.153	1	1	6.371	0.367
Index_skill	2.471	2	1	15.180	1.516
Index_demo	3.039	2.749	1	11.843	3.645
		West Zealand County			
Index_fore	1.097	1	1	7.224	0.305
Index_skill	2.154	2	1	10.866	1.146
Index_demo	2.714	2	1	11.940	1.706
		Vejle County			
Index_fore	1.077	1	1	6.153	0.237
Index_skill	2.245	2	1	10.757	1.124
Index_demo	2.912	2.586	1	11.850	1.840
		Ringkjøbing County			
Index_fore	1.067	1	1	4.284	0.210
Index_skill	2.787	2	1	9.583	1.143
Index_demo	3.005	2.749	1	11.872	1.897
		Viborg County			
Index_fore	1.085	1	1	5.038	0.252
Index_skill	2.256	2	1	13.594	1.241
Index_demo	2.809	2	1	12.131	1.768
		North Jutland County			
Index_fore	1.055	1	1	3.621	0.194
Index_skill	2.175	2	1	11.578	1.094
Index_demo	2.812	2	1	12.050	1.805
		Aarhus County			
Index_fore	1.061	1	1	4.704	0.209
Index_skill	2.207	2	1	11.586	1.145
Index_demo	2.793	2.217	1	11.546	1.729

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Patent production function estimation

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Unobserved heterogeneity

- To correct for **unobserved permanent differences** in patent productivity we utilize the fact that we have very long "pre-sample" histories at our disposal.
- Since a prominent feature of our data is an **overall increase** in the level of patenting during the pre-sample period, we **normalize** a firm's number of patents in a pre-sample year by the total number of patents applied for during that year as in Kaiser et al. (2008):

$$\eta_i = \frac{1}{17} \sum_{t=1978}^{1994} \frac{y_{it}}{Y_t}$$

- We also include a **dummy variable** equal to one if the firm had ever innovated prior to 1995.

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Firm internationalization process

- We study how diversity affects the export behavior of firms along the **intensive** and **extensive** margin.
- Diversity matters along two dimensions: productivity (Lawleess 2009; Eaton et al. 2009; Bernard and Jensen 2003) and **fixed costs of exporting** (Leonidou 2009).
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Export sales

- Total sales **aggregated** over all destination countries:

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Production function estimates

Food, beverages and tobacco			*Sale and repair of motor vehicles*		
	OLS	**LP**		**FE**	**LP**
Log($K_i t$)	0.502***	0.352***	Log($K_i t$)	0.508***	0.472
Capital	(0.016)	(0.011)	Capital	(0.007)	(0.008)
Log($L_i t$)	0.344***	0.256***	Log($L_i t$)	0.403***	0.383
Labor	(0.015)	(0.039)	Labor	(0.006)	(0.029)
Observations	14866	14957	Observations	31150	31256
Textiles			*Wholesale trade*		
	OLS	**LP**		**OLS**	**LP**
Log($K_i t$)	0.624***	0.539***	Log($K_i t$)	0.510***	0.480***
Capital	(0.022)	(0.016)	Capital	(0.008)	(0.004)
Log($L_i t$)	0.339***	0.339***	Log($L_i t$)	0.502***	0.470***
Labor	(0.020)	(0.025)	Labor	(0.007)	(0.014)
Observations	7411	7413	Observations	75588	31256
Wood products			*Chemicals*		
	OLS	**LP**		**OLS**	**LP**
Log($K_i t$)	0.579***	0.456***	Log($K_i t$)	0.575***	0.452***
Capital	(0.017)	(0.008)	Capital	(0.034)	(0.015)
Log($L_i t$)	0.387***	0.251***	Log($L_i t$)	0.426***	0.365***
Labor	(0.018)	(0.037)	Labor	(0.031)	(0.106)
Observations	23033	23057	Observations	8296	8296
Other non-metallic mineral products			*Transport*		
	OLS	**LP**		**OLS**	**LP**
Log($K_i t$)	0.570***	0.389***	Log($K_i t$)	0.548***	0.478***
Capital	(0.024)	(0.020)	Capital	(0.016)	(0.007)
Log($L_i t$)	0.430***	0.348***	Log($L_i t$)	0.353***	0.293***
Labor	(0.024)	(0.097)	Labor	(0.015)	(0.011)
Observations	4333	4359	Observations	42375	38362

Employee diversity effects on productivity, main results.

	Model(1)	Model(2)	Model(3)
Diversity Indexes:			
Index_fore	0.042***	0.040***	0.087***
	(0.004)	(0.004)	(0.005)
Index_skill	0.058***	0.048***	0.046***
	(0.002)	(0.002)	(0.002)
Index_demo	0.046***	0.036***	0.035***
	(0.001)	(0.001)	(0.001)
Year, industry, size and regional dummies	YES	YES	YES
Firm specific characteristics	NO	YES	YES
Workforce composition characteristics	NO	NO	YES

Employee diversity effects on productivity, iv approach.

	IV(1)	IV(2)
Diversity Indexes:		
Index_fore	0.088***	0.051***
	(0.005)	(0.010)
Index_skill	0.046***	0.044***
	(0.002)	(0.003)
Index_demo	0.035***	0.046***
	(0.001)	(0.002)
Year, industry, size and regional dummies	YES	YES
Firm specific characteristics	YES	YES
Workforce composition characteristics	YES	YES

Employee diversity effects on innovation.

	Poisson(1)	Poisson(2)	Poisson(3)	RE NegBin(1)	RE NegBin(2)	RE NegBin(3)
Diversity Indexes:						
Index_fore	0.237*	0.322**	0.333**	0.118	0.163**	0.113
	(0.141)	(0.125)	(0.152)	(0.081)	(0.082)	(0.129)
Index_skill	0.507***	0.163***	0.154***	0.435***	0.172***	0.159***
	(0.024)	(0.025)	(0.026)	(0.014)	(0.019)	(0.019)
Index_demo	0.422***	0.007	0.014	0.293***	0.019	0.029
	(0.027)	(0.030)	(0.031)	(0.017)	(0.023)	(0.024)
Year, industry, size and regional dummies	YES	YES	YES	YES	YES	YES
Firm specific characteristics	NO	YES	YES	NO	YES	YES
Workforce composition characteristics	NO	NO	YES	NO	NO	YES

Employee diversity effects on firm's internationalization.

	Export sales		*Number of products*		*Number of markets*	
	FE(1)	**FE(2)**	**NegBin FE (1)**	**NegBin FE (2)**	**NegBin FE (1)**	**NegBin FE (2)**
Diversity Indexes:						
Index_fore	0.164***	0.280***	0.050***	0.104***	0.048***	0.062***
	(0.037)	(0.062)	(0.150)	(0.027)	(0.013)	(0.022)
Index_skill	0.017	0.025***	0.054***	0.056***	0.026***	0.030***
	(0.017)	(0.017)	(0.007)	(0.007)	(0.007)	(0.007)
Index_demo	0.055**	0.058***	0.003	0.003	0.007***	0.006***
	(0.005)	(0.006)	(0.002)	(0.002)	(0.002)	(0.002)
Foreigners		0.538**		0.176**		0.065
		(0.226)		(0.099)		(0.083)
Year, industry and size dummies	YES	YES	YES	YES	YES	YES
Workforce composition characteristics	NO	YES	NO	YES	NO	YES

Employee diversity effects on sales by destination.

	FE(1)	FE(2)	FE(3)
Diversity Indexes:			
Index_fore	0.043***	0.018	0.018
	(0.017)	(0.025)	(0.025)
Index_skill	0.007	0.017***	0.017**
	(0.008)	(0.009)	(0.009)
Index_demo	0.012***	0.014***	0.014***
	(0.002)	(0.002)	(0.002)
Managers from country j			0.091
			(0.089)
Employees from country j			-0.021
			(0.025)
Year, industry and size dummies	YES	YES	YES
Workforce composition characteristics	NO	YES	YES

Employee diversity effects on the number of products by destination.

	NegBin FE (1)	NegBin FE (2)	NegBin FE (3)
Diversity Indexes:			
Index_fore	0.045***	0.134**	0.014**
	(0.005)	(0.007)	(0.007)
Index_skill	0.046***	0.050***	0.050***
	(0.002)	(0.003)	(0.003)
Index_demo	-0.002***	-0.002***	-0.002***
	(0.001)	(0.001)	(0.001)
Managers from country j			-0.023
			(0.025)
Employees from country j			-0.012
			(0.008)
Year, industry and size dummies	YES	YES	YES
Workforce composition characteristics	NO	YES	YES

Sensitivity analysis on productivity

- **Estimates** by industry, size, foreign ownership, quartiles of productivity and with the Herfindhal index confirm the main results.

▸ Results1

- We augment this basic specification to allow **for interaction effects**:
  1. across all dimensions of diversity
  2. with the share of high skilled workers
  3. with the share of young workers

▸ To Conclusion

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▸ To Conclusion

Sensitivity Analysis: estimates by relevant groups.

	Estimates by industry				
	Manufacturing	**Construction**	**Ws and retail trade**	**Transport**	**Financial and business activies**
Diversity Indexes:					
Index_fore	0.034**	0.045**	0.308***	0.003	0.043***
	(0.014)	(0.015)	(0.016)	(0.015)	(0.010)
Index_skill	0.032***	0.067***	–0.073***	0.068***	0.080***
	(0.006)	(0.003)	(0.004)	(0.007)	(0.004)
Index_demo	0.073***	0.051***	0.047***	0.025***	0.014***
	(0.004)	(0.002)	(0.004)	(0.005)	(0.004)
r2	0.10	0.13	0.13	0.13	0.08
N	105874	115638	205642	35290	76284
	Estimates by size, by foreign ownership and using the Herfindhal index				
	Less than 50 employees	**More than 50 employees**	**Domestic firms**	**Foreign owned firms**	**Herfindhal index**
Diversity Indexes:					
Index_fore	0.084***	0.084***	0.087***	0.076*	0.353***
	(0.004)	(0.024)	(0.005)	(0.036)	(0.074)
Index_skill	0.048***	0.016**	0.046***	0.020	0.073***
	(0.002)	(0.007)	(0.002)	(0.029)	(0.006)
Index_demo	0.038***	0.013**	0.035***	0.051*	0.280***
	(0.001)	(0.006)	(0.001)	(0.030)	(0.051)
r2	0.63	0.86	0.64	0.54	0.54
N	518322	20406	536700	2500	316391
	Quantile regressions				
	q(25)	**q(50)**	**q(75)**		**q(90)**
Diversity Indexes:					
Index_fore	0.015***	0.005**	–0.004**		0.059***
	(0.006)	(0.002)	(0.002)		(0.006)
Index_skill	0.026***	0.005***	0.009***		0.003
	(0.002)	(0.001)	(0.001)		(0.002)
Index_demo	0.014***	0.002***	0.007***		0.022***
	(0.002)	(0.001)	(0.001)		(0.001)
r2	0.13	0.10	0.19		0.23
N	134682	134682	134682		134682

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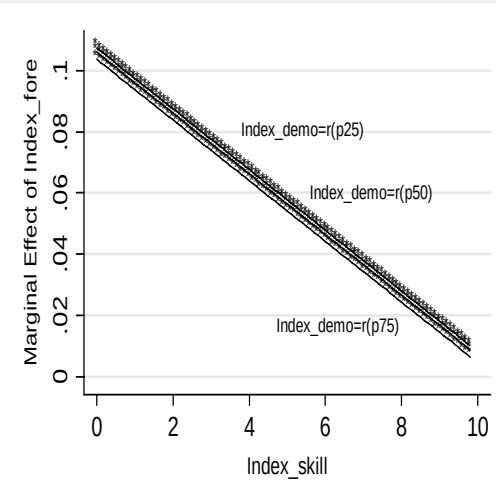
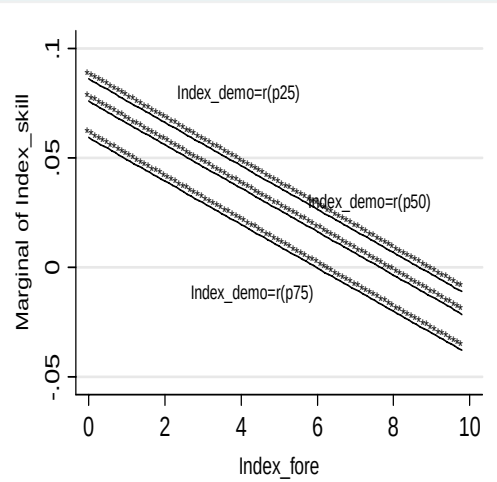
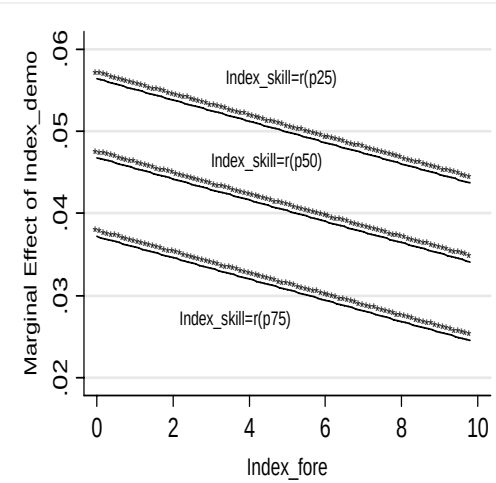
Interaction effects across all dimension of diversity







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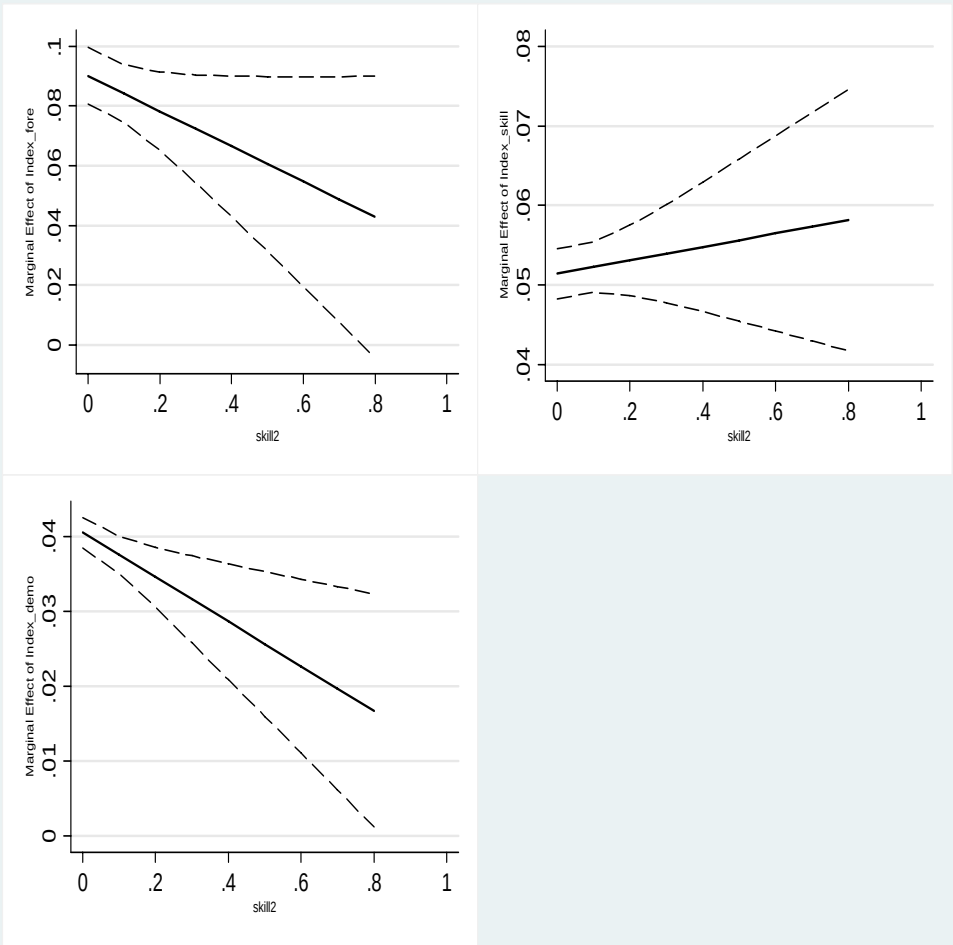
Interaction of diversity with the proportion of high skilled employees



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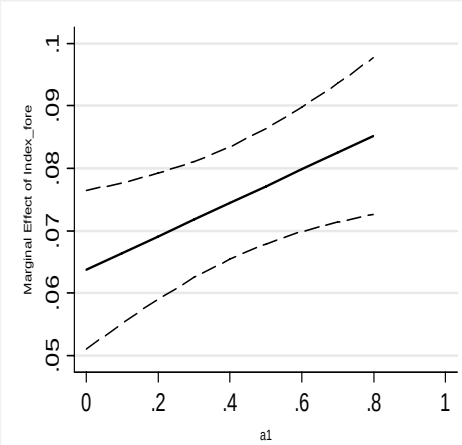
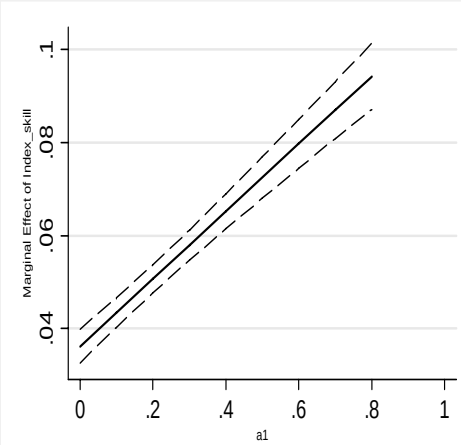
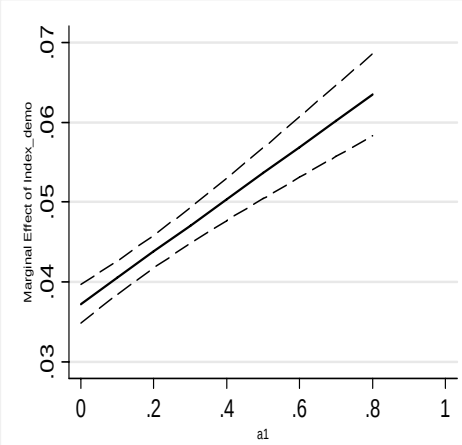
Interaction of diversity with the proportion of employees aged 15-28







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Conclusions: productivity and innovation

- Controlling for a wide set of firm specific characteristics, we find that diversity in cultural background, skills and demography **is positively related with firm productivity**.
- Firm innovation is consistently and positively affected by **skill heterogeneity** only.
- It also emerges that the presence of a **higher number of younger** increases the gains from diversity in terms of firm productivity.

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