

Innovation and Within Firm Wage Inequality

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Roadmap

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 - Data sources
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Motivation (1)

- The rising wage inequality is a hot topic both in economics and public agenda
 - 1970-1990: the relative wages of college graduates rises
 - Since 1990: "wage polarization" - fast wage increase at the top and bottom of wage distribution
- The main explanation is **skilled biased technological change**
 - Technological development increased the demand for specific occupations and tasks

Motivation (2)

- **How to measure technological development?**
 - the economy level: changes in the **return to specific tasks** (Card és DiNardo, 2002; Acemoglu és Autor, 2011)
 - the firm level: effect of **RD activities** of wages (Boeler, 2017; Aghion et al, 2017)
- Are there **other channels** of technological development?
(link)
 - technology adoption through machine import (Csillag-Koren 2017)
 - adoption of new management practices (Cai-Szeidl 2017)

The main research questions

- How does **technological development affect wage inequality**?
 - Does RD differs from other type of innovations?
 - How much innovation contributes to within and between firm inequality?

Main Results

- Innovation raises the wages of college graduates with 5%
- Firms with larger wage inequality are more likely to innovate
- RD innovation and other types of innovations have similar wage effect

Data(1)

- **RD survey**
 - firms have report their RD activities of the last year
 - non-reporting is not sanctioned - we do not observe every RD
- **Community Innovation Survey (CIS)** between 2004-2014
 - biannually repeated survey on innovation activities of firms
 - several type of innovations:
 - **technological innovation:** product and process innovation
 - **non-technological innovation:** organizational and marketing innovation

Data (2)

- **Structure of Earnings Survey** between 2004-2014
 - Every firms with more than 20 employees, a random sample of firms with less than 20 employees
 - worker sampling based on date of birth
 - detailed information on worker characteristics and wages in May
- **Balance sheet data** from firm income tax declarations
 - every double-bookkeeping firm
 - detailed information on balance sheet and profit and loss statement
- **Sample selection**
 - the firm appears in CIS at least two times
 - the firm did not report innovation activity in the first period

Descriptive statistics (1)

Year	CIS data	CIS & balance sheet	CIS & balance sheet & wage survey
2003	3950	3190	1483
2004	3950	3268	1408
2005	5094	4063	2275
2006	5094	4149	1995
2007	5390	4365	1796
2008	5390	4466	2216
2009	5120	4134	1811
2010	5120	4211	1740
2011	5482	4458	1981
2012	5482	4430	2126
2013	7243	5849	2407
2014	7243	5912	2512
összesen	64558	52495	23750

Descriptive statistics (2)

variable	w/o innovation	innovating	diff	tstat
average age of workers	42.1 (0.09)	41.3 (0.10)	-0.8	-6.94
share of women	0.21 (0.01)	0.19 (0.00)	-0.02	-3.43
average years of education	11.4 (0.02)	11.8 (0.03)	0.3	11.1
share of college graduates	0.12 (0.00)	0.18 (0.00)	0.05	12.7
average wage	173,087 (1,672)	206,746 (2,446)	33,659	12.9
exporting firm (dummy)	0.64 (0.01)	0.80 (0.01)	0.15	15.8
foreign owned (dummy)	0.31 (0.01)	0.41 (0.01)	0.11	8.71
number of workers	159 (7.43)	435 (44.9)	276	6.91
log(tangible assets/workers)	7.95 (0.03)	8.46 (0.03)	0.51	15.1
log(value added/workers)	8.24 (0.01)	8.54 (0.02)	0.30	14.7
Num. of observations	13,617	10,133		

Estimation strategy

- The wage effect of innovation:

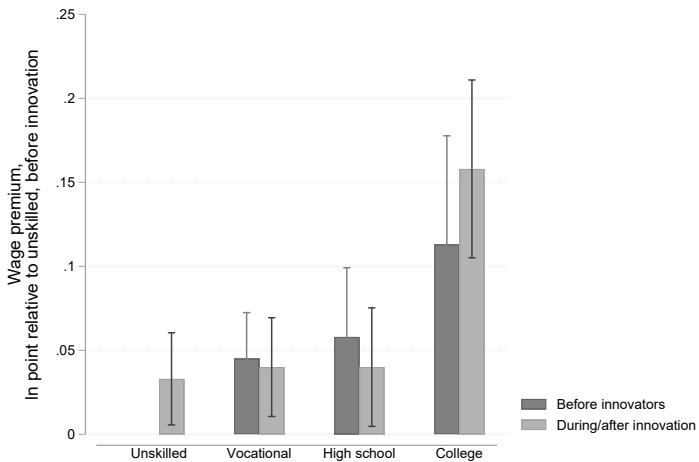
$$\ln wage_{ijt} = \sum_k \beta_{pre}^k * preinnov_{jt} * skill_{it}^k +$$

$$+ \sum_k \beta_{post}^k * postinnov_{jt} * skill_{it}^k +$$

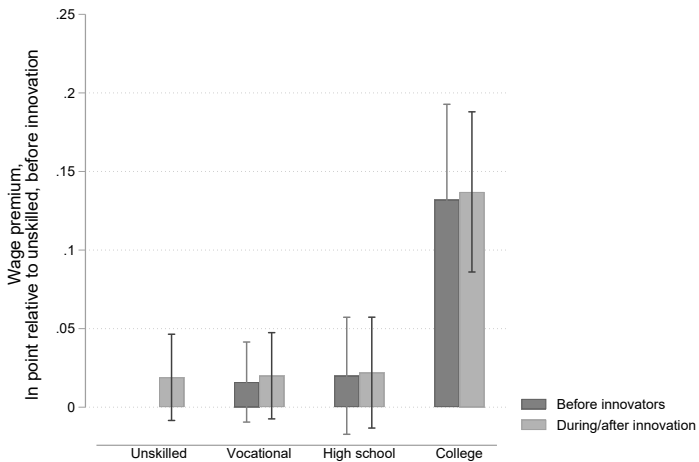
$$+ X_{ijt}\gamma + \zeta_{kt} + \mu_j + \epsilon_{ijt} \quad (1)$$

- main challenge in identification: **innovation may be correlated with unobserved firm characteristics**
 - we measure selection directly (β_{pre}^k)
 - we control for firm fixed effects

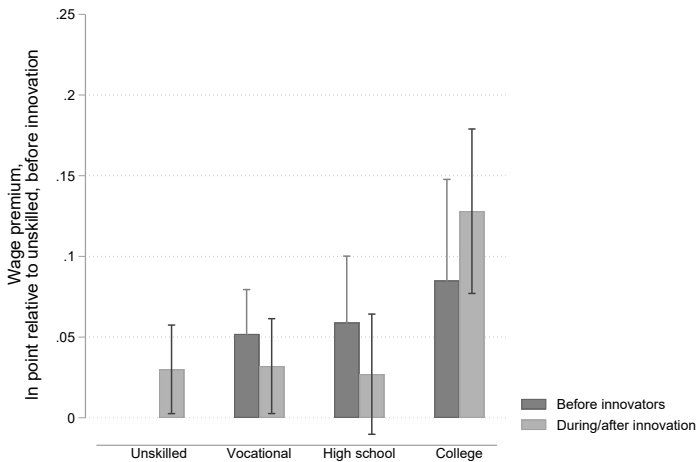
Main results



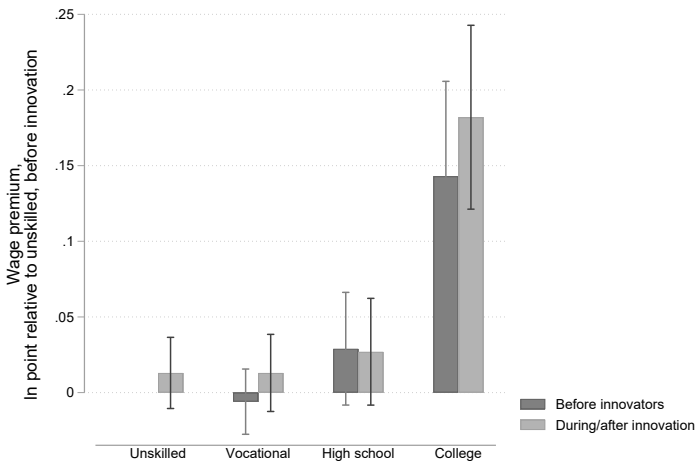
Main results - technological innovation



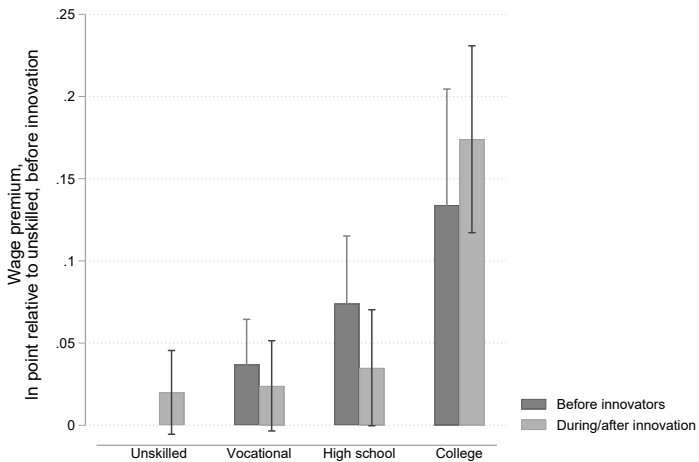
Main results - non-technological innovation



Base wage - technological innovation



Base wage - non-technological innovation



Summary

and next steps

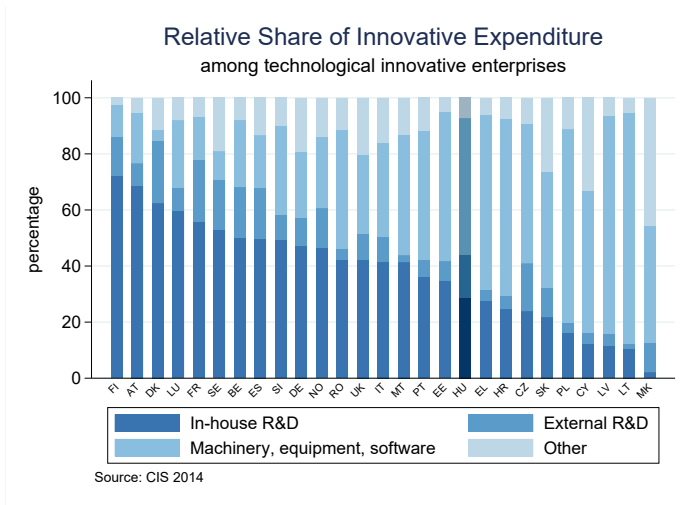
- The innovation increases the wage premium of college graduates
 - larger effect in case of non-technological innovation
 - larger pre-selection in case of technological innovation
- What are the effect of reform on **firm level outcomes**?
 - revenue, productivity, employment e.t.c.
- Is there **heterogeneity** in the effect of innovation?
 - first/temporary/permanent innovation activities
 - **development of the industry**

Summary

and next steps

Thank you for attention!

Type of innovations



(back)