

# Within and between firm trends in job polarization: Role of globalization and technology

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# Introduction

- Polarization of the labor markets is a “universal” phenomenon (e.g., Autor et al. 2003, Autor 2010, Goos, Manning & Salomons 2009, 2014)
- ..also in Nordic countries (e.g., Asplund et al. 2011, Maliranta 2013, Böckerman et al. 2016)
- Influential studies started a new literature trying to understand the extent, mechanisms and causes of the polarization

# Causes of job market polarization

- R&D (Böckerman et al. 2012)
- ICT (e.g. Böckerman et al. 2016, Michaels et al. 2014, Harrigan et al. 2016)
- International trade (e.g., Harrigan et al. 2016, Autor 2006 for discussion)
  - Michaels et al. (2014) found that the result is not robust to controlling for related factors such as R&D
  - Van Reenen (2011) argues that international trade does have a role, but it acts via ICT
- Outsourcing (Nilsson Hakkala & Huttunen 2016)
- Chinese import shocks (Autor et al. 2014, Keller and Utar 2016)

# Where are the firms?

Question: Where does polarization stem from? Answer: Individual firms' decisions to hire & fire workers and/or open & close establishments

- Firm data could tell us, e.g.:
  - Are mid-level jobs disappearing because certain firms exit?
  - Are service jobs increasing due to entry and/or expansion?
  - Are existing firms outsourcing / offshoring mid-level jobs while keeping managers and professionals?
- Harrigan, Reshef & Toubal (2016) find that job polarization happens mainly via within firms in France
- Cortes and Salvatori (2015) find that the increase in the number of establishments specializing in non-routine tasks seem to explain much of the polarization in the UK
- Heyman (2016) find that both within-firm and between-firm components are important in explaining overall job polarization in Sweden

# What we do?

- We examine the occupational polarization within and across firms
  - What is the role of establishment level restructuring...
  - ..or the role of entry-exit dynamics?
- We also examine the relation of globalization and technology on job polarization for continuing firms
- We also use international trade shocks as instruments for trade and outsourcing

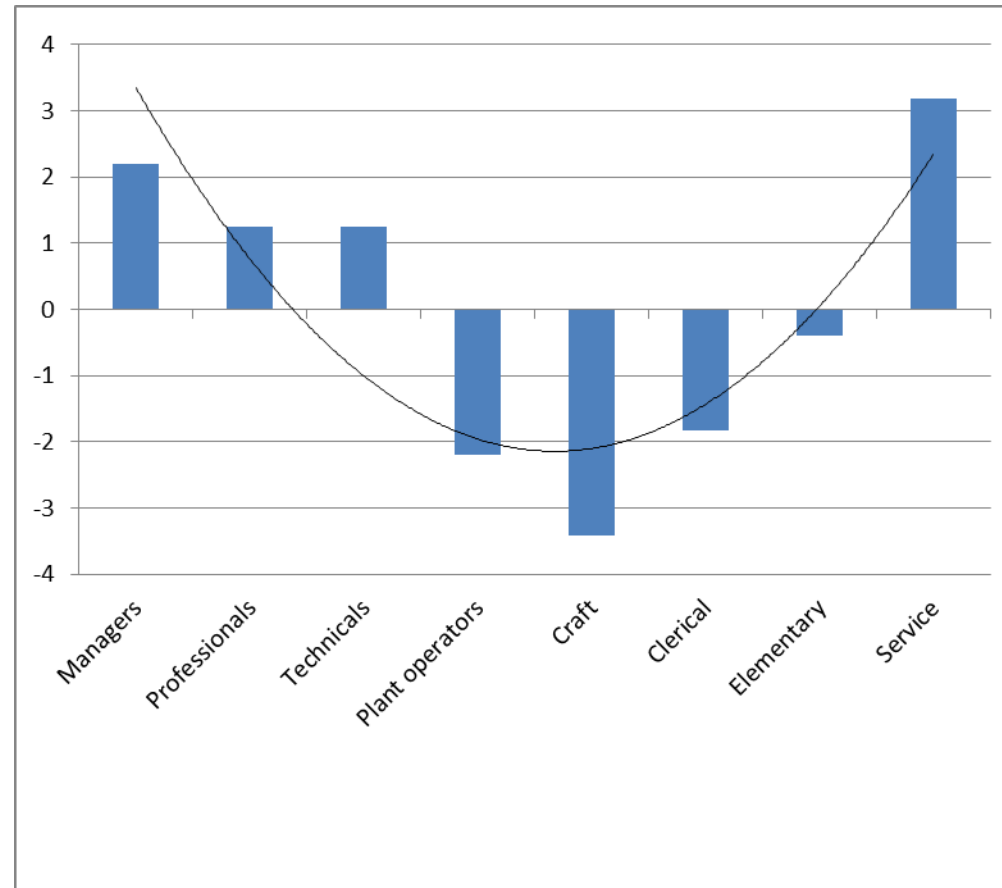
# Data

- FLEED (Total):
  - Firm – worker panel data 2000-09, incl. all firms & workers
  - Combines employment & wage statistics, education registers, tax records, business register, financial statement statistics
- Auxiliary firm level data sources
  - Customs data on goods & service exports and imports
  - ICT surveys
  - R&D surveys
  - International sourcing survey (outsourcing & offshoring)
- Other data sources
  - UN Comtrade data on imports and exports by country pair and detailed goods classification

# Data restrictions

- Workers
  - Working at least 6 months in the calendar year
  - Known occupation and earnings
  - Earnings winsorized (top- and bottom-1%)
  - ISCO-88 classification
  - No farmers / agricultural workers
- Firms
  - Private sector only
  - At least 10 employees

## Overall Pattern 2000-2009



Percent change in the occupation employment share,  
2000 to 2009

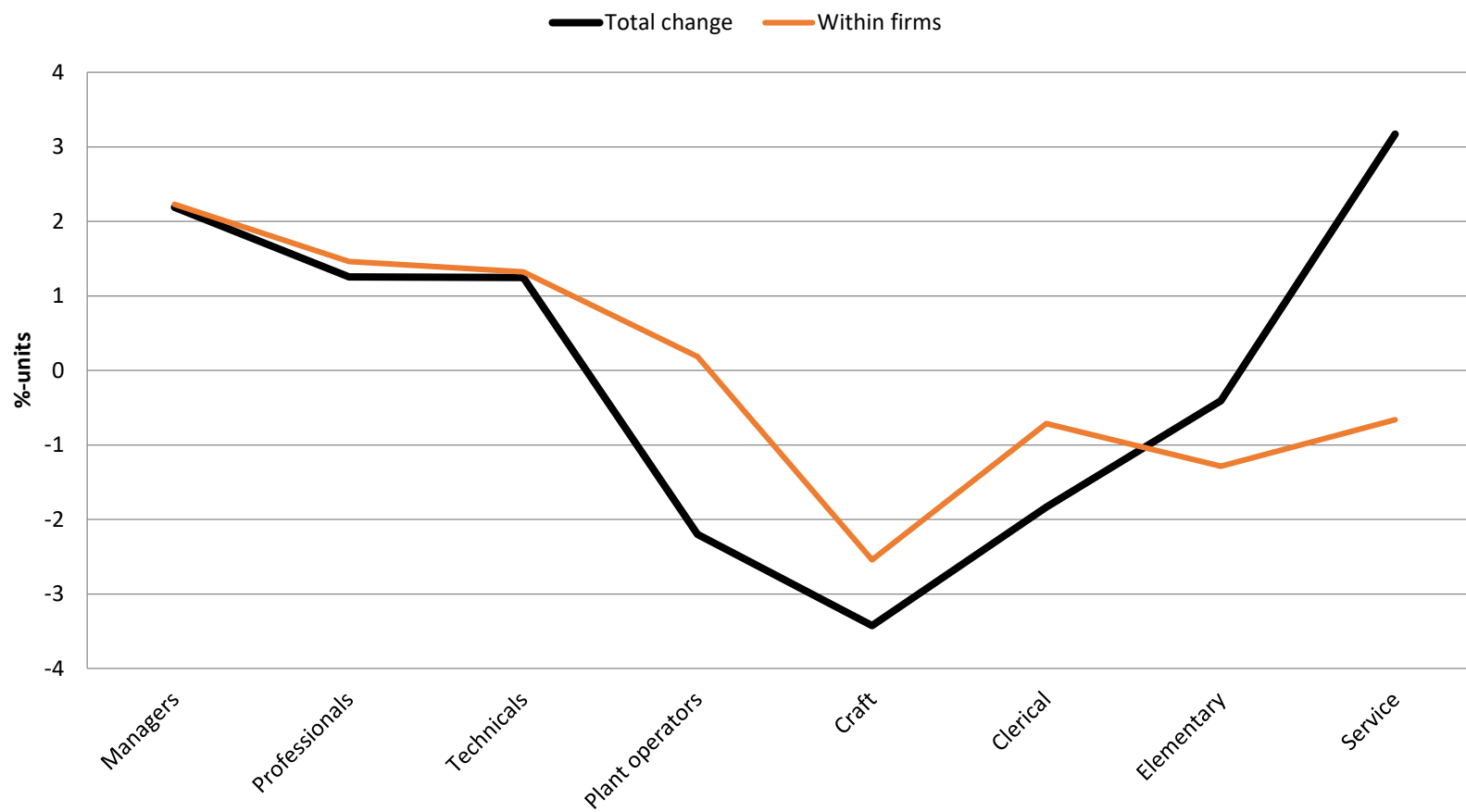


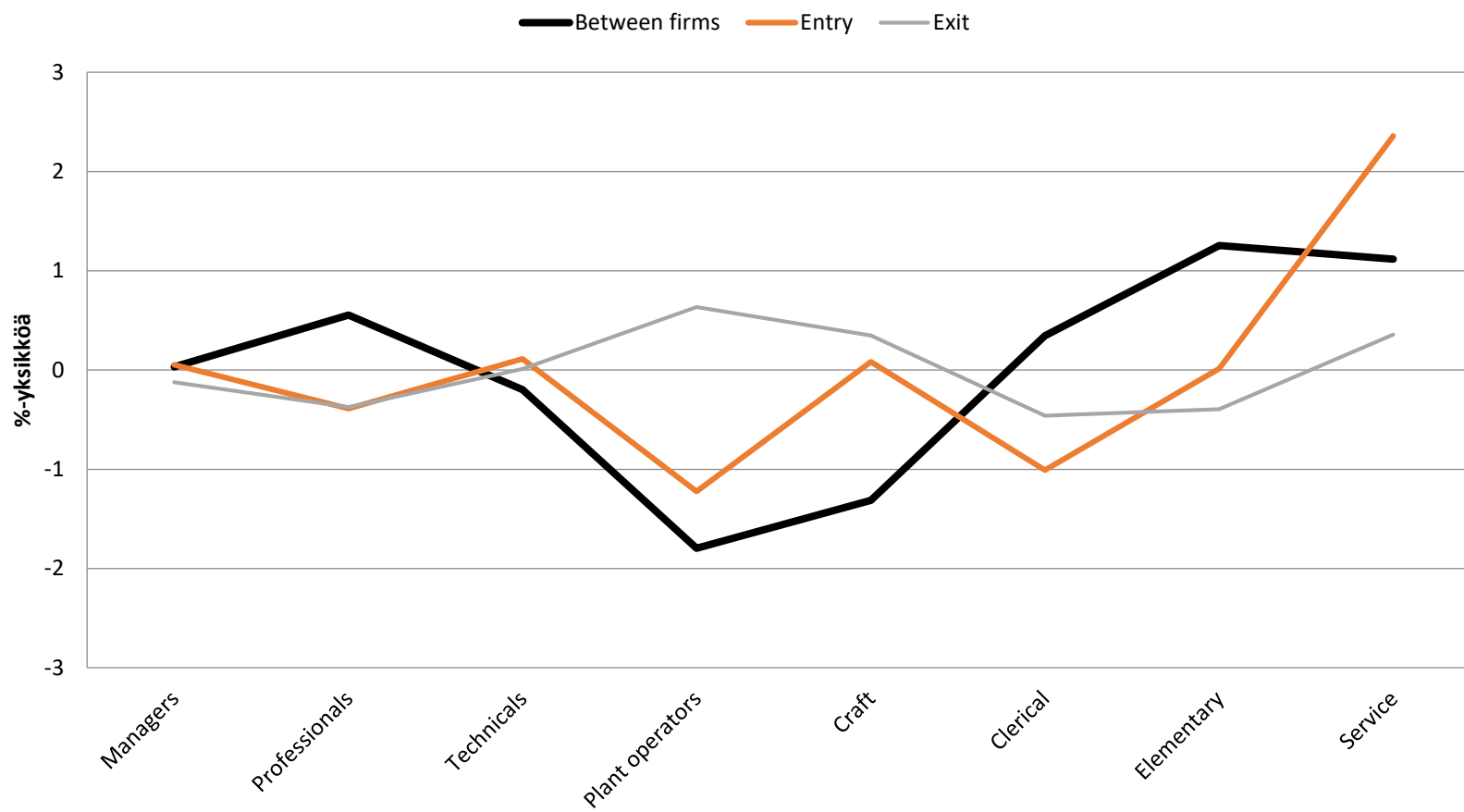
## Decomposition of job polarization at the firm level

- We follow Vainiomäki (1999) and decompose the change in share of occupation group  $j$  into four components
- Three types of firms in the market:
  1. Continuing firms: were in the market both in years  $t$  and  $t-1$  (here 2000 and 2009)
  2. Entering firms: were in the market in year  $t$  but not in year  $t-1$
  3. Exiting firms: were in the market in year  $t-1$  but not in year  $t$
- Continuing firms: within and between firms

$$\Delta S_j = \sum_{i \in C} \Delta S_{ij}^C \bar{W}_i^C + \sum_{i \in C} \bar{S}_{ij}^C \Delta W_i^C + W^N (S_{jt}^N - S_{jt}^C) + W^D (S_{j,t-1}^C - S_{j,t-1}^D),$$

- $\Delta S_j$  is the change in share of occupation  $j$ ,  $j = 1, \dots, 8$
- $C$  denotes continuing establishments,  $N$  the entrants,  $D$  the exiting establishments
- $\Delta S_{ij}^C$  is the change of employment share of occupation  $j$  in continuing establishment  $i$  from year  $t-1$  to  $t$
- $\bar{S}_{ij}^C$  is the average employment share of occupation  $j$  in continuing establishment  $i$  in years  $t$  and  $t-1$
- $S_{jt}^N$  and  $S_{jt}^C$  are the shares of occupation  $j$  among new and continuing establishments in year  $t$
- $S_{j,t-1}^C$  and  $S_{j,t-1}^D$  are the shares of occupation  $j$  among exiting and continuing establishments in year  $t-1$
- $\bar{W}_i^C$  is the average employment share of continuing establishment  $i$  in years  $t$  and  $t-1$
- $\Delta W_i^C$  is the change of employment share of continuing establishment  $i$  from year  $t-1$  to  $t$
- $W^N$  and  $W^D$  are the employment shares of entering establishments in years  $t$  and exiting establishments in year  $t-1$ , respectively





## Decompositions of employment share change by occupation group (2000 and 2009)

<b>Occupational group</b>	<b>Δ Emp. share</b>	<b>Within</b>	<b>Between</b>	<b>Entry</b>	<b>Exit</b>
Abstract	0.053	0.062	0.005	-0.013	-0.001
Routine	-0.086	-0.045	-0.031	-0.010	-0.000
Services	0.037	-0.002	0.029	0.012	-0.002
Elementary	-0.003	-0.015	-0.003	0.012	0.003

Abstract: managerial, professional & technical

Routine: clerks, plant operators & craft workers

# The role of globalization and technology

- Group occupations into:
  - 1: manager, professional & technical pers.
  - 2: plant operators, craft & clerical occup.
  - 3: service occupations
  - 4: elementary occupations
- Are occupation share changes (2000-2009) related to:
  - $\Delta(\text{goods exports})$ ,  $\Delta(\text{service exports})$
  - $\Delta(\text{goods imports})$ ,  $\Delta(\text{service imports})$
  - Outsourcing/Offshoring, and initial level of %ICT Use and R&D

# Dealing with Endogeneity

- Firm level decisions to outsource and to import /export are likely endogenous
- IV approach (Hummels et al., AER 2013)
  - Firm-product-country level measure of exposure to increased world supply
  - Shocks in trading environment (e.g. China WTO in 2001) have firm-specific impact depending on how engaged the firm is in trade within a specific affected goods category

# Instruments

- $IV_{it}^I = \sum S_{ick} WES_{ckt}$  for import
- $IV_{it}^E = \sum S_{ick} WID_{ckt}$  for export
- $IV_{it}^I$  and  $IV_{it}^E$  for outsourcing

$WES_{ckt}$  is the country  $c$ 's total supply of product  $k$  to the world market in year  $t$ , excluding the supply to Finland.  $WID_{ckt}$  is the country  $c$ 's total purchases of product  $k$  from the world market, excluding any demand from Finland. These are weighted by the each c-k combination with its share in firm's imports/exports

- We use the 2000-2009 change in the  $IV_{it}^I/IV_{it}^E$  as our instrumental variable for import and export, and 1999-2002 changes for outsourcing
- Creating  $WID_{ckt}$  and  $WES_{ckt}$  we use Comtrade data



		<i>Dependent Variable: Change in the Occupation Group Share</i>			
<b>Explanatory variable</b>		Group 1: Man, Pro & Tech	Group 2: Pri, Craf & Cler	Group 3: Service	Group 4: Elementary
<b>Panel C: Include Import and Export Variables in the Same Regression</b>					
Change in export of goods	OLS	-0.0113 (.0005)	0.0076 (.0004)	0.0004 (.0002)	0.0033 (.0003)
Change in import of goods		-0.0048 (.0004)	-0.0019 (.0004)	0.0004 (.0002)	0.0068 (.0003)
Change in export of goods	2SLS	-0.0092 (.0029)	0.0116 (.0028)	0.0002 (.0024)	-0.0027 (.0025)
Change in import of goods		0.0040 (.0044)	-0.0108 (.0043)	0.0037 (.0016)	0.0031 (.0034)
<b>First-Stage Regression Statistics</b>					
Change in export of goods	iv_exp	-0.6052			
	iv_imp	0.0314			
	1st Stage F-stat	32.84			
Change in import of goods	iv_exp	-0.1521			
	iv_imp	-0.7542			
	1st Stage F-stat	14.54			
Number of Firms		7,091	7,091	7,091	7,091

		<i>Firms with at Least 10 Employees in 2000 &amp; 2009</i>			
<b>Explanatory variable</b>		Group 1: Man, Pro & Tech	Group 2: Pri, Craf & Cler	Group 3: Service	Group 4: Elementary
<b>Panel A: Add Basic Firm Level Controls</b>					
Outsourcing / Offshoring	2SLS	-0.0512 (.0985)	0.2742 (.1199)	0.0032 (0.0333)	-0.2262 (.1078)
	iv_exp	-0.0830			
	iv_imp	0.0865			
	1st Stage F-stat	5.23			
<b>Panel C: Outsourcing in Finland, Abroad versus Planned (Include Basic Controls)</b>					
Outsourcing in Finland	2SLS	-0.0456 (.0736)	0.2077 (.0786)	0.0028 (.0252)	-0.1649 (.0751)
	iv_exp	-0.1105			
	iv_imp	0.0988			
	1st Stage F-stat	8.82			
Outsourcing Abroad	2SLS	-0.0481 (.0709)	-0.1625 (.0673)	0.0019 (.0238)	0.2087 (.0705)
	iv_exp	0.0793			
	iv_imp	-0.2944			
	1st Stage F-stat	8.60			
Plan to Oursource 2007-	2SLS	0.0149 (.0666)	0.1754 (.0635)	-0.0003 (.0227)	-0.1900 (.0607)
	iv_exp	-0.1025			
	iv_imp	0.2481			
	1st Stage F-stat	16.38			

Direction of the relation between different factors and change in occupation share (2000 and 2009)

Factor	Abstract	Routine	Service	Elementary
IV-results				
$\Delta(\text{Export of goods})$	-	+		
$\Delta(\text{Import of goods})$		-	+	
Outsource, domestic		(+)		(-)
Outsource, foreign		(-)		(+)
Plan to outsource		+		-
OLS results:				
$\Delta(\text{Export of services})$		+		-
$\Delta(\text{Import of services})$		+	-	-
ICT use		-		
R&D		-	+	+

## Results, summary

- The share of high-level occupations increases largely within continuing firms
- Routine jobs are being destroyed both among continuing firms and at the entry-exit margin
- New firms tend to hire more service workers, but the service jobs are increasing also via establishment level restructuring among continuing firms
- R&D and ICT are related to a decrease in routine occupations in continuing firms. R&D is also related to an increase in service jobs
- International trade affects the restructuring of occupations