Università degli Studi di Napoli "Parthenope"

5th European User Conference for EU-Microdata

Shrinking middle-skilled jobs and wage inequality in Europe during the Great Recession

Rosalia Castellano Gaetano Musella Gennaro Punzo

Outline

- Definitions: Job Polarization, Upgrading and Downgrading of Occupations
- The origins of the phenomena
- Employment Structure in Europe
- Decomposition Methods
- Methodology: Recentered Influence Function (RIF) regression
- Aims of the Analysis
- Jobs Classification
- Exploratory Analysis: Employment Structure
- Main Results
- Conclusions
- References

Overview

- A large and growing body of research details the changes in the employment composition by skill levels in the developed labour markets from the 1970s to the 2008-09 recession

- Much attention has been dedicated to the employment structure for its potential connection with the inequality in wage distribution.

- The central aim of the work is to investigate how the heterogeneity in the individual capacity to earn income among different categories of employees affects wage inequality (potential link between the employees' skills and earnings inequality).

What are the Job Polarization, Upgrading and Downgrading of Occupations

- The common element that defines the different structural changes in the labour markets is the shrinking of the jobs requiring a middle level of competences (e.g., job polarization, upgrading and downgrading of occupations) (Autor, 2003; Goos and Manning, 2007; Fernandez-Macias, 2012)

- The Job Polarization is the phenomenon in which growth occurs in the employment rate of the Low-Skill and High-Skill works, with a concurrent reduction in the employment rate of Medium-Skill activities

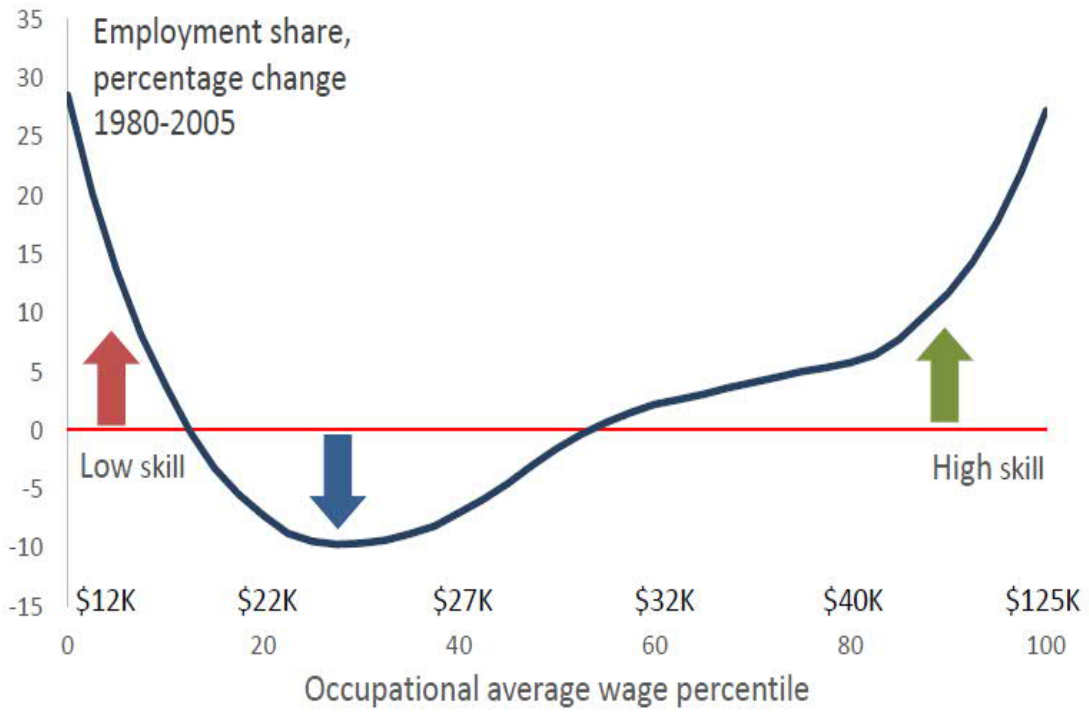
- Upgrading of occupations favours workers with high-qualifications

- Downgrading of occupations represents the case in which low-skilled jobs grow faster than other ones.

The origins of the phenomena (Autor et al., 2003)

- Former studies carried out by Autor et al. (2003) highlighted that the structure of employment in the United States was rapidly changing. According to this, two trends were identified:
  - Workers were less frequently employed in occupations with medium qualification and increasingly employed in low-skilled jobs.
  - The amount of highly skilled workers (typically employed in intellectual careers or in business management) tended to constitute a growing portion of the Us total occupation

The origins of the phenomena (Autor et al., 2003)

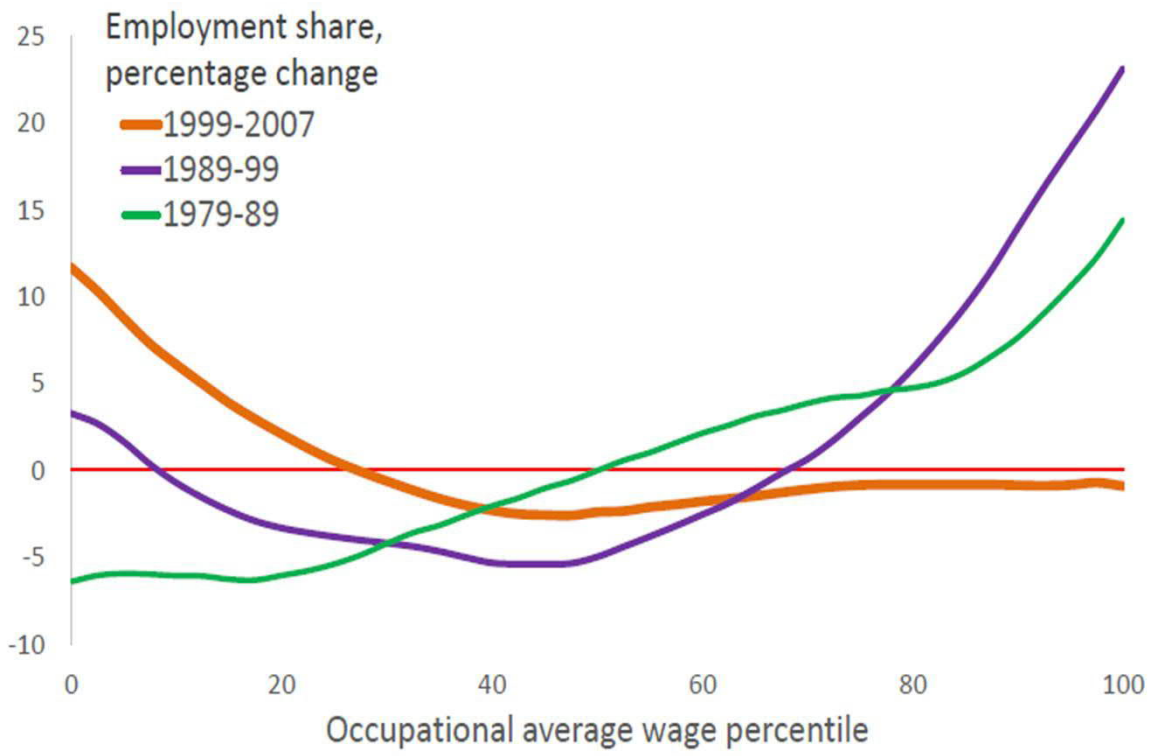


Source: Autor and Dorn (2013)

The figure illustrates the change in the employment rate for the period 1980-2005.

- On the x-axis activities are classified in ascending order, according to the skill level. It is approximated by the average wage of workers.
- The y-axis of the figure corresponds to the change in employment at each occupational percentile

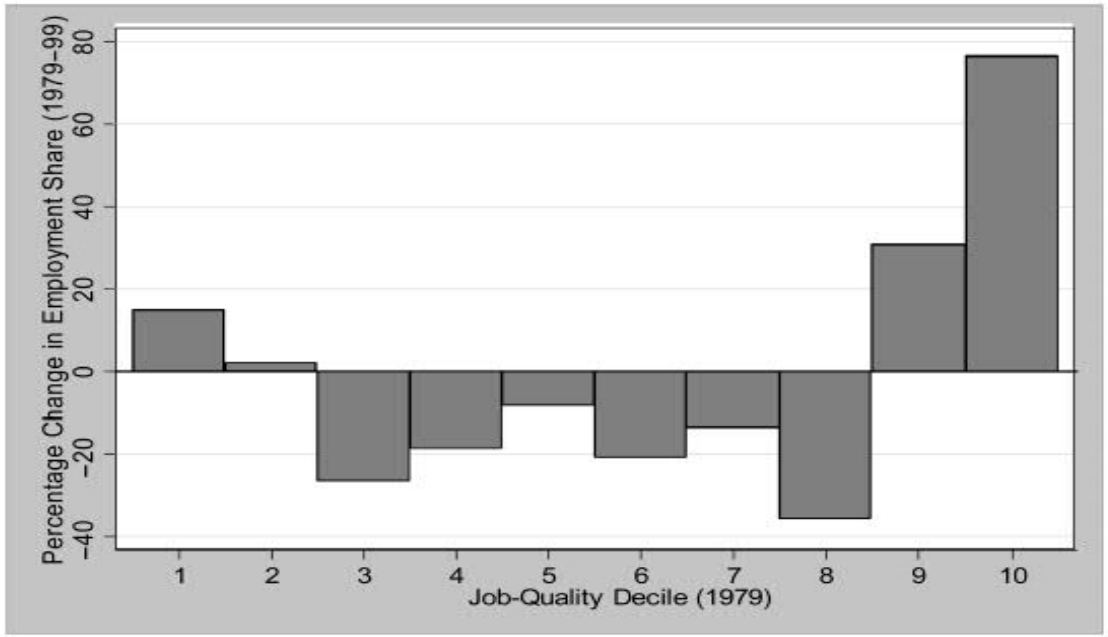
The origins of the phenomena (Autor et al., 2003)



Source: Autor (2010)

- 1979-1989: employment growth by occupation was almost uniformly rising in occupational skill. Only the occupations above the median increased.
- 1989-1999: The U-shaped curve showing a distinct pattern of polarization.
- 1999-2007: Employment growth was heavily concentrated among lowest deciles of occupations. In the highest deciles, employment shares were flat.

-PERCENTAGE CHANGE IN EMPLOYMENT SHARE BY JOB-QUALITY DECILE



Notes: Employment data are taken from the LFS using three-digit SOC90 codes. Employment changes are taken between 1979 and 1999. Quality deciles are based on three-digit SOC90 median wages in 1979 taken from the NES.

- Goos and Manning (2007) investigated the phenomenon for the UK, showing a trend similar to that of the United States.
- Quality of work as measured by the occupational median wage
- Growth in the employment share in the tails of the distribution
- Contraction in the central part of distribution

- Several subsequent studies argued that the process of job polarization was mostly restricted to the wage structure

- The choice of the classification criteria of the jobs can lead to alternative evidence on the employment patterns

- Ranking the occupations according alternative approach (e.g., average level of educational attainment) the process of structural change varies considerably across Europe

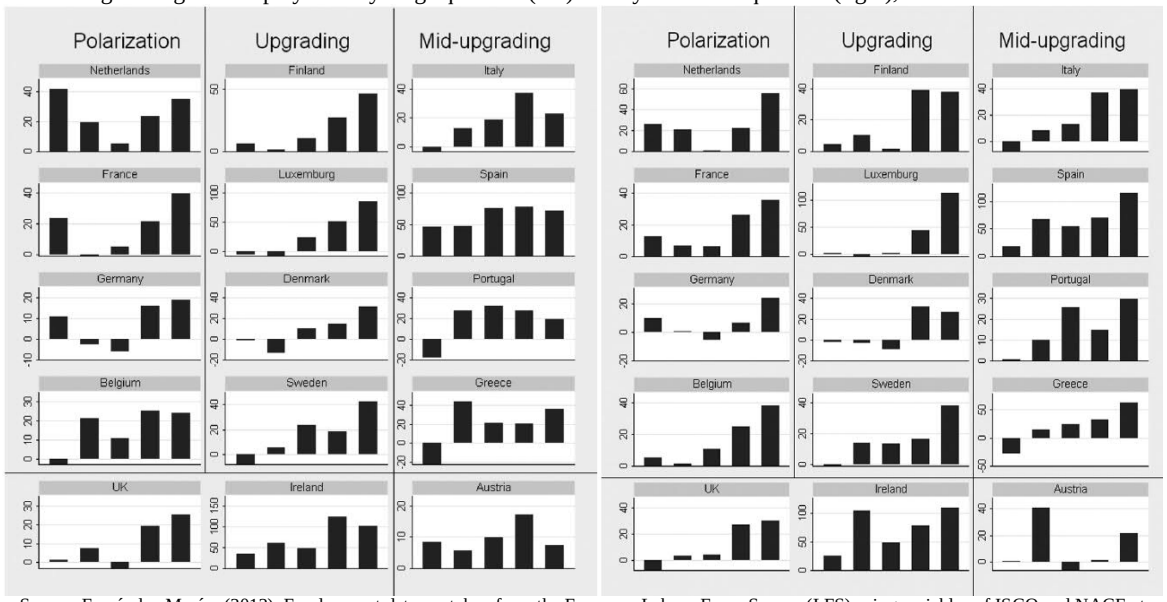
- The reason for this inconsistency is the different position that the jobs most affected by structural decline have in different grouping methods (e.g., some jobs could be *mid-paid activities* in terms of wages and *bad jobs* in terms of the education)

- Fernández-Macías (2012) evaluated the nature of structural change in employment from an alternative perspective (the so-called “jobs approach”), during almost the same period (1995-2007) and considering the same group of countries (EU15) analyzed in the work of Goos et al. (2009)

- The results achieved do not confirm the hypothesis of a prevalent pattern of job polarization across Europe.

Employment Structure in Europe

Percentage changes in employment by wage quintiles (left) and by education quintiles (right), 1995-2007



Source: Fernández-Macías (2012). Employment data are taken from the European Labour Force Survey (LFS) using variables of ISCO and NACE at the two-digit level with high degree of international harmonization.

- Fernández-Macías (2012) evaluated the nature of structural change in employment from an alternative perspective (the so-called "jobs approach"), during almost the same period (1995-2007) and considering the same group of countries (EU15) analyzed in the work of Goos et al. (2009)
- Quality of work as measured by educational attainment
- The results achieved do not confirm the hypothesis of a prevalent pattern of job polarization across Europe.

Oaxaca-Blinder decomposition:

- Are generally used to provide information on topics of economic interest as the increase of wage inequality.
- The seminal works by Oaxaca (1973) and Blinder (1973) are the most heavily cited in labour economics and the Oaxaca-Blinder (OB) decomposition is now a standard tool in applied economists.
- the Oaxaca-Blinder procedure allows splitting the *aggregate decomposition* (*total gap* in outcome variable) into the *unexplained* and the *explained* components (in this work, called *wage structure* and *composition effect*, respectively)
- Once obtained the two components, it would be possible to analyse the contribution that each covariate provides.

Oaxaca-Blinder decomposition:

- Oaxaca-Blinder decomposition has some main limitations:

1. The estimation of the wage structure and composition effects can be misleading if the linear model is unspecified (Barsky et al, 2002)

2. The contribution of each covariate to the wage structure is highly sensitive to the choice of the base group (Oaxaca and Ransom, 1999; Gardeazabal and Ugidos, 2004)

3. Oaxaca-Blinder method enables to apply the decomposition only to the mean

Recentered Influence Function Regressions (Firpo, Fortin e Lemieux, 2007; 2009; 2011):

RIF regression has the advantage of being applicable to different distributional statistics beyond the mean (e.g., quantiles, variance or the Gini coefficient)

A “Two Stages“ procedure to decompose main changes in the wage distribution:

- First Stage: the overall differential is split into the wage structure (capability of the country’s labour market to transform individual skills into job opportunities and earnings) and composition effect (the portion of the change attributable to the employees’ characteristics)
- Second Stage: the contribution of each explanatory variable leads to the two components mentioned is quantified

Methodology: Recentered Influence Function (RIF) Regression

RIF regression replaces the dependent variable, Y, with the recentered influence function of the statistic of interest.

$$RIF(Y;v) = IF(Y;v) + v$$

v = v(F) is the generic distributional statistic to study

IF(Y;v) is the influence function that measures the relative effect of a small perturbation in the underlying outcome distribution on the statistic of interest and represents a measure of robustness of *v*

Methodology: Recentered Influence Function (RIF) Regression

The overall difference between the two groups (G=A and G=B) is decomposed in two components

$$\Delta_0^{\mu} = \Delta_s^{\mu} + \Delta_x^{\mu}$$

Δ_0^{μ}: Overall average wage gap

Δ_s^{μ}: Wage Structure: changing the structural form of the phenomenon maintaining constant individual characteristics (Composition Effect remains constant)

Δ_x^{μ}: Composition Effect: is the variation in the distribution of covariates X from their value, from its value at G = A to its value at G = B (Wage Structure remains constant)

Methodology: RIF regression on Gini Index

RIF-regression procedure allows an exploration of the main determinants of the wage inequality generating-process and a decomposition of the changes in the inequality.

$$RIF(Y; v^{GC}) = IF(Y; v^{GC}) + v^{GC}$$

Where:

$$v^{GC}(F_Y) = 1 - 2\mu^{-1}R(F_Y)$$

$$F(y; v^{GC}) = 2\mu^{-1}R(F_y) + 2\mu^{-2}R(F_y) - 2\mu^{-1}[y[1 - p(y)] + GL(p(y); F_y)]$$

Recentered influence function on Gini Index can be written as:

$$RIF(y; v^{GC}) = 1 + 2\mu^{-2}R(F_y) - 2\mu^{-1}[y[1 - p(y)] + GL(p(y); F_y)]$$

Aims of the Analysis

The key questions of interest are:

- Evaluate how the different employment structure affect wage inequality
- Evaluate how much of the changes in the wage inequality can be attributed to the employees' characteristics (composition effect) or to the capability of the country's labour market to transform individual skills into job opportunities and earnings (wage structure).

For these purposes, the RIF regression on Gini index on (log of) gross individual wages are individually estimated for France, Germany, Italy and the United Kingdom for 2005 and 2013.

Aims of the Analysis

The objective of the Exploratory analysis is to determine in which European countries the Job Polarization occurs, and in which there is an upgrading of occupations.

Data: European Union Survey on Income and Living Condition, 2005 and 2013

Units provided for reference: Employees

The employment considered is the main one, that is the activities in which the largest number of hours are usually worked.

Jobs Classification in the Analysis

High skilled	Legislators, senior officials and managers
	Corporate managers
	Physical, mathematical and engineering science professionals
	Life science and health professionals
	Teaching professionals
	Other professionals (incl. business, legal, social science)
	Physical and engineering science associate professionals
	Life science and health associate professionals
	Teaching associate professionals

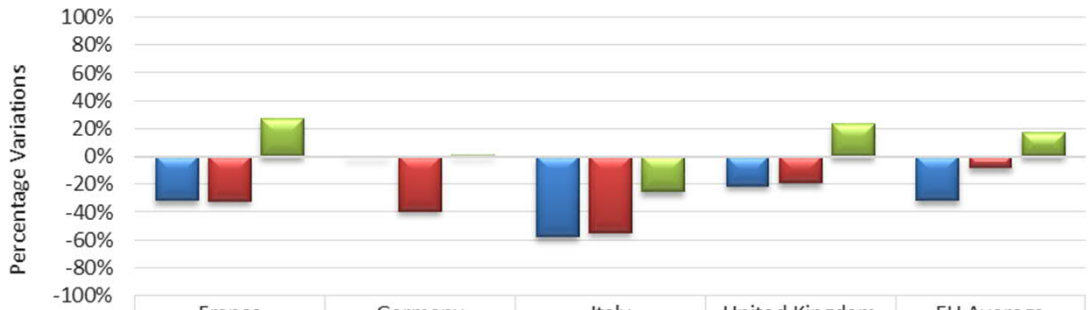
Medium skilled	Managers of small enterprises
	Other associate professionals
	Office clerks
	Customer service clerks
	Personal and protective service workers
	Models, salespersons, and demonstrators
	Building and extraction trades workers
	Metal, machinery and related trades workers
	Precision, handicraft and printing workers

Low skilled	Skilled agricultural and fishery workers
	Other craft and related trades workers (incl. food processing, textile)
	Stationary plant and machine operators
	Machine operators and assemblers
	Drivers and mobile plant operators
	Sales and services elementary occupations
	Agricultural, fishery and related labourers
	Labourers in mining, construction, manufacturing and transport.

- D. Autor (2003): Occupational Average Wage
- M. Goos e A. Manning (2007): Occupational Median Wage
- **Fernandez-Macias (2012): Mean Educational Level** → **Classification used by Eurofound**

Exploratory Analysis: Employment Structure

Employment shares by skill levels. Percentage changes 2005–2013



	France	Germany	Italy	United Kingdom	EU Average
Low-Skilled	-31,74%	-1,08%	-57,74%	-21,16%	-31,67%
Middle-Skilled	-31,94%	-39,36%	-54,48%	-19,21%	-8,48%
High-Skilled	27,17%	0,76%	-25,33%	23,35%	16,93%

Source: Author's calculation on EU-SILC data

Job Polarization	Upgrading	Hybrid
Germany	France The United Kingdom Europe Average	Italy

The analysis focuses on the changes that have occurred between 2005 and 2013 across four countries of Western Europe:

- Germany, whose labour market is currently characterised by job polarization
- France and the United Kingdom, which are characterised by the existence of upgrading of occupations
- Italy, where neither of the two phenomena can be clearly identified

Main Results

RIF-regression decomposition of Gini index on log-wage by country. Gap between 2005 and 2013.

	France		Germany		Italy		United Kingdom	
	2005 – 2013	% share	2005 – 2013	% share	2005 – 2013	% share	2005 – 2013	% share
Total gap	0,00406*** (0,0007)	-	0,0042*** (0,0007)	-	-0,0064*** (0,0004)	-	-0,0011* (0,0006)	-
Composition effect	0,0030*** (0,0004)	76.32	0,0040*** (0,0003)	94.38	-0,0018*** (0,0001)	28.94	0,0020*** (0,0006)	-184,9
Wage structure	0,0018** (0,0007)	46.17	0,0013** (0,0006)	32.35	-0,0059*** (0,0004)	93.08	-0,0014** (0,0007)	131,4
Interaction	-0,0009** (0.0004)	-22.49	-0,0011*** (0,0003)	-26.73	0,0014*** (0,0002)	-22.03	-0,0017** (0,0007)	153,5

Decomposition results:

- The overall Gini index has declined for Germany and France between 2005 and 2013

- In Italy and the United Kingdom, the analysis shows a substantial rise in the overall Gini coefficient of the wage distribution over the time span of interest

Main Results

RIF-regression decomposition of Gini index on log-wage by country. Gap between 2005 and 2013.

	France		Germany		Italy		United Kingdom	
	2005 – 2013	% share	2005 – 2013	% share	2005 – 2013	% share	2005 – 2013	% share
Total gap	0,00406*** (0,0007)	-	0,0042*** (0,0007)	-	-0,0064*** (0,0004)	-	-0,0011* (0,0006)	-
Composition effect	0,0030*** (0,0004)	76.32	0,0040*** (0,0003)	94.38	-0,0018*** (0,0001)	28.94	0,0020*** (0,0006)	-184,9
Wage structure	0,0018** (0,0007)	46.17	0,0013** (0,0006)	32.35	-0,0059*** (0,0004)	93.08	-0,0014** (0,0007)	131,4
Interaction	-0,0009** (0.0004)	-22.49	-0,0011*** (0,0003)	-26.73	0,0014*** (0,0002)	-22.03	-0,0017** (0,0007)	153,5

Decomposition results:

- RIF regression decomposition highlights a significant contribution of both composition (endowment) and wage structure (return) effects
- For Germany and France, a great amount of the total gap (94.38 percent and 76.32 percent, respectively) is attributable to the changes in employees' individual characteristics that have occurred over time (composition effect)
- In Italy and the United Kingdom the structural changes that have occurred in their labour markets (wage structure) play a leading role in the increase in wage inequality over time (93.08 percent and 131.4, respectively)

Conclusions

RIF-regression decomposition of Gini index on log-wage by country. Gap between 2005 and 2013.

	France		Germany		Italy		United Kingdom	
	2005 – 2013	% share	2005 – 2013	% share	2005 – 2013	% share	2005 – 2013	% share
Total gap	0,00406*** (0,0007)	-	0,0042*** (0,0007)	-	-0,0064*** (0,0004)	-	-0,0011* (0,0006)	-
Composition effect	0,0030*** (0,0004)	76.32	0,0040*** (0,0003)	94.38	-0,0018*** (0,0001)	28.94	0,0020*** (0,0006)	-184,9
Wage structure	0,0018** (0,0007)	46.17	0,0013** (0,0006)	32.35	-0,0059*** (0,0004)	93.08	-0,0014** (0,0007)	131,4
Interaction	-0,0009** (0.0004)	-22.49	-0,0011*** (0,0003)	-26.73	0,0014*** (0,0002)	-22.03	-0,0017** (0,0007)	153,5

Some results seem to suggest how the employment structure could explain a fraction of wage inequality:

- Gini index decreased in both Germany and France where well-defined structures of job polarisation and upgrading of occupations, respectively, are sketched
- In Italy, whose labour market is not clearly defined, inequality increased substantially.
- The United Kingdom being the only exception in which Gini index increased despite the labour market follows the typical behaviour of upgrading of occupations

References

- D. Autor, F.Levy, R. Murnane, (2003), "*The Skill-Contenent of Recent Technological Change: An Empirical Investigation*", Quartely Journal of Economics, 118, 1279-1333.
- D. Autor, D., (2010), "*The Polarization Of Job Opportunities In The U.S. Labor Market*", The Hamilton Project
- M. Goos, A. Manning, (2007), "*Lousy and Lovely Jobs: The Rising Polarization of Work in Britain*", Review of Economics and Statistics, 89, 118-42.
- M. Goos, A. Manning, A. Salomons, (2009), "*Job Polarization in Europe*", American Economic Review, 99, 58-63.
- Fernández-Macías, E. (2012). *Job Polarization in Europe? Changes in the Employment Structure and Job Quality, 1995-2007*, Work and Occupations 39 (2), 157-182.
- D. Williams, (2010), "*Educational Intensity Of Employment And Polarization in Europe and the US*", Eurostat Methodologies and Working Paper

References

- S.Firpo, N. Fortin, T. Lemieux, (2007), *Decomposing Wage Distributions Using Recentered Influence Function Regressions*, University of British Columbia.
- Firpo, S., Fortin, N., Lemieux, T. (2009). *Unconditional Quantile Regressions*, Econometrica 77(3), 953-973.
- Fortin, N., Lemieux, T., Firpo, S. (2011). *Decomposition Methods in Economics*, Handbook of Labor Economics.
- Oaxaca, R. (1973). *Male-Female Wage Differentials in Urban Labor Markets*, International Economic Review 14(3), 693-709.
- Oaxaca, R., Ransom, M.R. (1999). *Identification in Detailed Wage Decompositions*, Review of Economics and Statistics 81(1), 154–157.
- Blinder, A. (1973), *Wage Discrimination: Reduced Form and Structural Estimates*, Journal of Human Resources 8, 436-455.
- Barsky, R., Bound, J., Charles, K., Lupton J. (2002). *Accounting for the Black-White Wealth Gap: A Nonparametric Approach*, Journal of the American Statistical Association 97(459), 663-673.
- Gardeazabal, J., Ugidos, A. (2004). *More on Identification in Detailed Wage Decompositions*, The Review of Economics and Statistics 86 (4), 1034-1036.