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

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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
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).
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.
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 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.

Source: Autor and Dorn (2013)
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.
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.
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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
RIF regression replaces the dependent variable, Y, with the recentered influence function of the statistic of interest.

\[ RIF(Y;v) = IF(Y;v) + \nu \]

\( \nu = \nu(F) \) is the generic distributional statistic to study.

\( IF(Y;\nu) \) 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 \( \nu \).
The overall difference between the two groups (G=A and G=B) is decomposed in two components:

\[ \Delta_0 = \Delta_s + \Delta_x \]

- \( \Delta_0^\mu \): Overall average wage gap
- \( \Delta_s^\mu \): Wage Structure: changing the structural form of the phenomenon maintaining constant individual characteristics (Composition Effect remains constant)
- \( \Delta_x^\mu \): 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)
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:

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

<table>
<thead>
<tr>
<th>High skilled</th>
<th>Medium skilled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legislators, senior officials and managers</td>
<td></td>
</tr>
<tr>
<td>Corporate managers</td>
<td></td>
</tr>
<tr>
<td>Physical, mathematical and engineering science professionals</td>
<td></td>
</tr>
<tr>
<td>Life science and health professionals</td>
<td></td>
</tr>
<tr>
<td>Teaching professionals</td>
<td></td>
</tr>
<tr>
<td>Other professionals (incl. business, legal, social science)</td>
<td></td>
</tr>
<tr>
<td>Physical and engineering science associate professionals</td>
<td></td>
</tr>
<tr>
<td>Life science and health associate professionals</td>
<td></td>
</tr>
<tr>
<td>Teaching associate professionals</td>
<td></td>
</tr>
<tr>
<td>Managers of small enterprises</td>
<td></td>
</tr>
<tr>
<td>Other associate professionals</td>
<td></td>
</tr>
<tr>
<td>Office clerks</td>
<td></td>
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<tr>
<td>Customer service clerks</td>
<td></td>
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<tr>
<td>Personal and protective service workers</td>
<td></td>
</tr>
<tr>
<td>Models, salespersons, and demonstrators</td>
<td></td>
</tr>
<tr>
<td>Building and extraction trades workers</td>
<td></td>
</tr>
<tr>
<td>Metal, machinery and related trades workers</td>
<td></td>
</tr>
<tr>
<td>Precision, handicraft and printing workers</td>
<td></td>
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</tbody>
</table>

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

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

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total gap</strong></td>
<td>0.00406*** (0.0007)</td>
<td>-</td>
<td>0.0042*** (0.0007)</td>
<td>-</td>
<td>-0.0064*** (0.0004)</td>
<td>-</td>
<td>-0.0011* (0.0006)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Composition effect</strong></td>
<td>0.0030*** (0.0004)</td>
<td>76.32</td>
<td>0.0040*** (0.0003)</td>
<td>94.38</td>
<td>-0.0018*** (0.0001)</td>
<td>28.94</td>
<td>0.0020*** (0.0006)</td>
<td>-184.9</td>
</tr>
<tr>
<td><strong>Wage structure</strong></td>
<td>0.0018** (0.0007)</td>
<td>46.17</td>
<td>0.0013** (0.0006)</td>
<td>32.35</td>
<td>-0.0059*** (0.0004)</td>
<td>93.08</td>
<td>-0.0014** (0.0007)</td>
<td>131.4</td>
</tr>
<tr>
<td><strong>Interaction</strong></td>
<td>-0.0009** (0.0004)</td>
<td>-22.49</td>
<td>-0.0011*** (0.0003)</td>
<td>-26.73</td>
<td>0.0014*** (0.0002)</td>
<td>-22.03</td>
<td>-0.0017** (0.0007)</td>
<td>153.5</td>
</tr>
</tbody>
</table>
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)**
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.


<table>
<thead>
<tr>
<th>Country</th>
<th>Total gap</th>
<th>Composition effect</th>
<th>Wage structure</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>0.00406***</td>
<td>0.0030***</td>
<td>0.0018**</td>
<td>-0.0009***</td>
</tr>
<tr>
<td>2005 - 2013</td>
<td>0.0007</td>
<td>0.0004</td>
<td>0.0007</td>
<td>0.0004</td>
</tr>
<tr>
<td>%share</td>
<td></td>
<td>76.32</td>
<td>46.17</td>
<td>-22.49</td>
</tr>
<tr>
<td>Germany</td>
<td>0.0042***</td>
<td>0.0040***</td>
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<td>Italy</td>
<td>-0.0064***</td>
<td>-0.0018***</td>
<td>-0.0059***</td>
<td>0.0014***</td>
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<tr>
<td>2005 - 2013</td>
<td>0.0004</td>
<td>0.0001</td>
<td>0.0004</td>
<td>0.0002</td>
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<tr>
<td>%share</td>
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<td>28.94</td>
<td>93.08</td>
<td>-22.03</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>-0.0011*</td>
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References