

# **Organizational Change, Polarization and Gender**

(Work in Progress)

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## **Abstract (Extended)**

Technological and organizational change emerged as one of the leading explanations for increasing wage inequality since the 1980s, especially for the US and the UK. The idea behind is that new technologies lead to higher productivity, but only the higher skilled workers possess the necessary skills to operate them. Technological innovations, biased in favour of skilled workers, lead to a rising demand for highly-skilled workers and to increasing educational wage differentials. Autor, Levy and Murnane (ALM; 2003) put a more sophisticated structure to the skill-biased technological-change-hypothesis by explaining how computerization affects labor markets. By defining a job as a composition of tasks that a worker has to perform at his workplace, ALM argue that technology can substitute human work regarding routine tasks - tasks that can be expressed by a series of rules- but cannot (so far) replace human labor in non-routine tasks. They provide evidence for a shift in demand from routine to non-routine tasks within education groups, occupations and industries and that industries with heavy usage of routine tasks have experienced the highest adoption of computers. A similar pattern is found by Spitz-Oener (2006) for West-Germany.

The ALM-framework seems to well explain a recently observed pattern in labor markets: the polarization of work. During the last decades, occupations at the top of the wage distribution experienced the largest growth rate, while occupations in the middle experienced a decrease in employment shares relative to occupations at the bottom. Many of the worst-paid occupations, for example personal care, housekeeping, hotel and catering services, are non-routine in nature and have been relatively unaffected by technological innovations, while routine manufacturing or routine office occupations are found predominantly in the middle and occupations with a high abstract task usage at the high end of the wage distribution. The polarizing distribution of occupations is shown for the US (Autor, Katz and Kearney [2006, 2008] and Autor and Dorn [2007]), the UK (Goos and Manning [2007]) and West-Germany (Spitz-Oener [2006] and Dustmann, Ludsteck and Schönberg [2009]).

Another development we observe in labor markets during the last decades is the narrowing gender wage gap in almost all industrialized countries. This change is partly related to supply-side effects like improved institutional arrangements, higher labor force attachment and improving educational achievements of women. However, these developments are not able to explain all the wage improvements of women.

Our hypothesis is that polarization and the improvements of women relative to men along the wage distribution are interlinked and possibly driven by technological innovation. Technological change enables organizational changes in both nature and conditions of work and benefits women by de-emphasising physical skills. Work is going to be less physical and more automated. To formalize our hypothesis, we use a simple model of comparative advantage that helps to explain the way technological innovations affect the gender gap along the distribution of wages. The model illustrates how a decline in the price of capital affects both the distribution of wages and the gender gap along the distribution: If routine tasks are performed in the middle, manual tasks at the bottom, abstract tasks at the top of the distribution and if men have a comparative advantage concerning routine tasks, then technological innovations lead to a polarization of labor demand and women should gain relative to men mainly at the middle of the wage distribution.

We are able to analyze the relationships between technological and organizational change, polarization and the gender gap directly at the level of the firm. This paper therefore establishes a direct link between technological innovation and wage shares within firms along the wage distribution, task characteristics of jobs along the wage distribution and in consequence, changes in the gender gap along the wage distribution.

Our empirical analysis is based on three data sets: the IABS, a 2% random sample of social security records, the LIAB, a linked employer-employee data set and the Qualification and Career Survey.

*IABS*: A 2% sample of administrative social security records in Germany for the years 1975 to 2004. The data is representative for all individuals covered by the social security system, roughly 80% of the German workforce. It excludes the self-employed, civil servants and individuals doing their military service.

*LIAB*: A linked employer-employee data set provided by the Institute of Employment Research (IAB). It combines information of the IAB Establishment Panel with information on all workers who were employed in one of these firms as of the 30<sup>th</sup> of June since 1993. The

LIAB contains for instance information on firm size, union coverage, industry, organizational changes; daily wages, education, age, nationality and occupations of workers employed in each firm. As our technological measure on the firm-level we use an aggregation of 4 potential reorganization practices of a firm within two years.

*Qualification and Career Survey*: Individual-level survey data provided by the German Federal Institute for Vocational Training. It includes about 30'000 workers and contains information on task requirements at the workplace. Occupations are categorized according to the same classification as for the linked employer-employee data set and the task content of each occupation is merged on the 2-digit occupation-level to the firm data.

We find some support for our hypothesis: On the individual-level, routine manual tasks are mainly located in the middle of the wage distribution and performed predominantly by men, while on top of the wage distribution, men and women perform similar tasks (mainly abstract). At the level of the firm, wage shares in occupations characterized by abstract tasks increase, while wage shares in routine manual tasks decrease with reorganization. We further find a strong negative impact of reorganization in the middle of the wage distribution for men, whilst there is hardly any effect for women. Therefore, technological change may help to explain relative strong gains of women in the middle of the wage distribution for West-Germany in the 1990s.