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Do de-routinization and exposure to automation influence job stress? Evidence from European survey data

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Extended abstract

The past decades have been characterized by sequential waves of digital transformations that deeply affect labour markets. The most studied wave that covers our period of observation is the 3.0 wave that run since 2000 with an expected end around 2025 (Arntz et al., 2019). The large reduction of computerization costs induces a large diffusion of technologies in firms that are supported by computers and software algorithms (e.g. warehouse management systems, workflow, groupware). These algorithm-based technologies have been most efficient in performing tasks that are well-defined, structured, and repetitive tasks, in short – routine tasks (both cognitive and manual) and have mainly replaced middle-skilled workers who tend to perform such tasks (Autor et al., 2003).

Aa growing number of studies deals with the impact of technological progress and de-routinization on various labour market outcomes. A first strand of the literature is dedicated to the impact on the volume of work and two views compete. On the one hand, analyses conducted at the occupation-level show pessimistic effects (e.g. Frey & Osborne, 2017). On the other hand, analyses conducted at the job/task-level highlight optimistic effects (e.g. Arntz et al., 2016; Nedelkoska & Quintini, 2018). In sum in OECD countries, the figures go from 9% to 47% of jobs in high risk of being replaced by automation in 2030. Moreover, the impact of this 3.0 digital wave relates to a

polarization of the labour market, i.e. an increase of low and high skilled jobs associated with a decrease of middle skilled jobs (see the literature review by Acemoglu & Autor, 2011). In parallel, newspapers for the wider audience circulate mostly pessimistic view of digital transformations (Miller & Atkinson, 2013).

A second strand of the literature focuses on other labour market outcomes like wages, hours of work and job security. For example, Bessen et al., (2019) show for workers employed in firms that adopt robots face significantly higher risk of separation, followed by a decrease in annual days worked, leading to a 5-year cumulative wage income loss of about 8% of one year's earnings.

A third strand of the literature studies the tasks that are at risk of automation. Existing research distinguish between routine (manual, cognitive) and non-routine (manual, analytical, interactive) tasks (e.g. Autor et al. 2003; Atalay et al. 2018; Lewandowski et al. 2019). As the manual and cognitive routine tasks are easily automated, their role declines around the world while the importance of analytical and interpersonal tasks increases. Therefore, the decrease of routine tasks that are boring and repetitive induces the free up of workers' time to be dedicated to more interesting tasks. However, only a minority of displaced routine workers is able to upgrade to non-routine jobs (Cortes, 2016).

A fourth strand of the literature focuses on the effect of technology on workers well-being and attitudes. Bloom, et al. (2014) and Martin (2017) underline the positive effect of using information technologies (such as Enterprise Resource Planning; workflow or ideas management systems) on empowering and motivating workers but also show an opposite effect of communication technologies (such as intranet; groupware or real-time collaborative editing platforms). Brougham & Haar (2018) show that a greater awareness of new technologies is negatively related to organizational commitment and job satisfaction, but positively related to turnover intentions and depression. Mark et al. (2016), reveal also that the use of emails induce stress.

All strands of literature highlight both negative and positive impacts of digital transformations on workers. However, the question on the relationship between de-routinization and job stress is still under-researched. Studies of job quality effects tend to focus on the use of information and communication technologies and don't account for the exposure of workers to automation technologies. Our paper fills this gap.

In this paper, we will shed light on the following research question: does de-routinization and exposure to automation influence job quality, in particular job stress in Europe? We focus on job stress because it's a key facet of job quality in Europe: at the EU-level the costs (overall costs, direct health costs and loss of productivity) due to stress at work is estimated to be more than 450 billion EUR per year (International Labour Organization, 2016).

To conduct our analysis, we use data from the European Working Conditions Survey from 1995 to 2015 that allow us to measure job stress and other aspects of job quality (at a worker level). In order to quantify the exposure to de-routinization, we use the Acemoglu & Autor (2011) task content measures based on the O*NET database, as well as the Lewandowski et al. (2019)

measures that are country-specific. To quantify automation, we use International Federation of Robotics data on industrial robots. In order to establish the effects of de-routinization and automation more precisely, we control for a number of confounding factors, in particular for exposure to globalization using the Wang et al. (2017) indicators from the RIGVC UIBE (2016) database. We also take into account other trends that affect jobs in the same period such as the intensification of work as underlined by Green and Mostafa (2012).

We test the following hypotheses:

1.a. If the widespread fear of skills mismatch and obsolescence in the working population is detrimental to workers, de-routinization and exposure to automation will be positively related to job stress;

1.b. If de-routinization is beneficial to workers through the loss of boring tasks and the gain of interesting tasks at the workplace, de-routinization and exposure to automation will be negatively related to job stress;

2. Job stress is much more vivid for older workers than younger ones that grew with the use of digital tools.

For our currently running analyses, we use worker-level models estimation on a repeated cross section survey with instrumental variables applied to exposure to automation technology. We also use cohort analysis and panel regressions estimated for occupational classes distinguished on the basis of task content of jobs.

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