Jobs Exposure to Generative AI: Ongoing Study by NASK-PIB and ILO

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Abstract

The rapid advancement of artificial intelligence (AI), including generative AI (GenAI), raises important questions about its impact on the labour market and employment structure. This study examines the extent to which various occupations are exposed to GenAI by developing an index to identify potential shifts in the nature of work. The analysis focuses on specific occupational tasks that may be affected to varying degrees by the proliferation of AI tools. The study categorises occupations into four groups: susceptible to automation (Automation potential), subject to augmentation by GenAI (Augmentation potential), characterised by significant uncertainty (Big unknown), and not susceptible to technological change (Not affected). The research was conducted in three stages: assessing occupational exposure, verifying findings with expert analysis, and extrapolating results to 30,000 tasks across 2,500 occupations, with the support of ChatGPT-4. The findings enable estimates of the occupational groups most "at risk" from GenAI and contribute to macroeconomic forecasts for the Polish labour market.

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1. Introduction

The debate about the capabilities and limitations of artificial intelligence (AI) has dominated public space in the recent months. Much of this discussion pertains to economic issues – changes which the introduction of AI tools brings about for the global economy. However, an emotional and controversial question is whether AI tools will be able to replace humans in the labour market.

Translating this into the language of social studies, we talk about the fear of automation and technological unemployment. This problem is analysed, among others, in the paper titled 'Who's afraid of automation? Examining determinants of fear of automation in six European countries' [1]. Its authors used data from the Central European Social Survey conducted at the turn of 2021 and 2022 in six Central European countries. Analysis on a sample of 6600 economically active people showed that one in six respondents was afraid of the impact of automation. More importantly, the more an economic sector is saturated with technology, the greater the fear of automation. Therefore, both knowledge of technology and its presence in one's workplace exacerbate the fear of automation [1].

Workplace automation (robotisation) historically preceded the current process involving the popularisation of AI tools (in particular those based on generative artificial intelligence (GenAI)) that may replace human tasks. Therefore, it is ever so pertinent to ask the following questions: What jobs are most exposed to this process? How can we study that?

This problem is solved, thanks to macroeconomic forecasts estimating the impact of GenAI on economy and the labour market. This not only allows large economic organisations to plan efforts and determine long-term strategies but also equips labour market actors with the knowledge needed to decide how to shape and design their career paths.

This precisely – developing an index of occupations which would allow for estimating their exposure to GenAI tools – is what we have set out to do within the framework of the project titled, 'The potential impact of generative artificial intelligence on job quantity and quality in Poland', implemented, as commissioned by the Ministry of Digital Affairs, at the Research and Academic Computer Network (NASK) in cooperation with International Labour Organisation (ILO). The detailed assumptions for this project are described in the inception report [2].

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2. The Impact of GenAI on the Labour Market – A Methodological Review

In the recent years, the issue of developing an index for the possible use of GenAI in respective occupations has been described in literature for many times. There are a few approaches that are worth mentioning. The most popular index is the one developed by Felten et al. [3,4] – AI occupational exposure (AIOE). It measures job exposure to AI, enabling the assessment of the degree to which various occupations are exposed to AI impacts, without determining whether these impacts are positive or negative. In this approach, the researchers invoked 10 AI applications specified by the Electronic Frontier Foundation, such as abstract strategy games, real-time video games, image recognition, visual question answering, image generation, reading comprehension, language modelling, translation, speech recognition, and instrumental track recognition. These AI applications were collated together with 52 human abilities (such as oral comprehension, oral expression, inductive reasoning, arm-hand steadiness, etc.) collected in the Occupational Information Network (O*NET) database developed by the US Department of Labor. Each of over 800 occupations is perceived as a weighted combination of 52 human abilities. Felten's team sent their study questionnaire to gig workers at Amazon Mechanical Turk (mTurk) and collected 1800 responses [4]. The respondents had to assess whether a specific task could be performed by GenAI tools. Exposure at skill level was calculated as the total of connections between AI applications and human skills. Then, AIOE was calculated for each occupation (consisting of specific skills), accounting for how important and widespread these skills are in a given occupation [4, pp. 3–4].

In their modified approach published in 2023, the authors singled out 'language modelling' as the key skill to be replaced by GenAI. They then specified as to what extent this skill is important for the respective occupation.

Summing up this approach, the authors specified occupations that are most vulnerable to automation. These included telemarketers, English language and literature teachers, foreign language and literature teachers, history teachers, clinical psychologists, advisors, and local government workers [4, p. 14]. Viewing the data from the industry perspective, the most vulnerable are legal services, financial services (trading in securities), insurance and employee benefit funds as well as universities and training institutions [4, p. 15].

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In Poland, the Polish Economic Institute published in 2024 its report titled 'AI na polskim rynku pracy' ('AI on the Polish labour market') [5], presenting estimates concerning the Polish labour market based on the aforementioned AIOE index. The researchers estimated that there are 3.68 million Poles in the 20 occupations most exposed to AI [5, p. 24].

Another approach involves analysing the demand for certain skills in a given labour market. For example, Acemoğlu et al. [6] analysed online job postings and their specific skill requirements. They considered such sources as burning glass technologies and job search sites. In the research process, it was necessary to identify the skills and technologies advertised. The weakness of this method lay in the skew towards jobs posted online. Therefore, this approach did not work in countries where most job vacancies were advertised offline.

Yet another method found in source literature is experiment-based analysis. In Peng et al. [7], researchers performed a controlled experiment among professional programmers who were given the chance to use GenAI tools. It turned out that access to a GenAI assistant shortened the time they needed to complete their programming tasks by 56%. Brynjolfsson et al. [8] conducted an experiment among customer service workers in the Philippines. The opportunity to use GenAI tools resulted in the greater number of problems solved per hour.

3. The Impact of GenAI on the Labour Market – Study Conducted by NASK National Research Institute, Poland (NASK-PIB) and ILO

The method adopted in our study is an elaboration on the approach presented in 'Generative AI and Jobs: A global analysis of potential effects on job quantity and quality' [9]. The cited study assumes as its starting point the fact that every occupation consists of tasks assigned to it. Taking this into account, the researchers prepared a ChatGPT4 prompt (using the Application Programming Interface [API]) and asked the model to show the potential for automating a given task based on its linguistic description. ChatGPT assigned a value from 0 to 1 to each task, with 0 meaning automation is completely impossible, and 1 meaning that it is fully possible. The results were statistically elaborated with two measures defined: the average result (average of all tasks in an occupation) and standard deviation (distribution of automation results for tasks in an occupation).

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As a result of this analysis, the authors suggested dividing the respective occupations into the following four groups, accounting for the probability of change due to AI tools becoming more and more popular:

- *Automation potential*: Occupations where most of today's tasks could theoretically be performed using GenAI – such occupations could potentially be automated without the need for human presence.
- *Augmentation potential*: Occupations where some of the tasks can be performed using GenAI, but most have to be performed by humans – such occupations may be augmented through GenAI, accelerating the performance of some tasks and providing more space for creative work for humans and new tasks.
- *Big unknown*: This category is between the *automation potential* and *augmentation potential*, representing jobs in which the balance of today's tasks hangs between those which can and those which cannot be performed with GenAI. As technologies develop and occupations evolve, this balance may shift, driving some occupations towards the *automation potential*, and some towards the *augmentation potential*.
- *Not affected*: Occupations in which most of the tasks cannot be performed using GenAI (e.g. physical tasks).

It is this method, modified, that is used precisely in the study performed by NASK-PIB) and ILO. Its most important assumption, like in Gmyrek et al. [9], is to use the assessment of the automation potential for tasks comprising a given occupation. The important difference lies in the fact that we divided the process of assigning an index value to the occupations into three stages: (1) assessing the potential for exposure of employee-performed tasks in a given occupation group (with 1600 respondents assessing the respective tasks participating at this stage of the study); (2) having the assessment verified by a group of experts; and (3) extrapolating the assessments onto 30,000 tasks representing 2500 occupations (using ChatGPT4).

The outcome is a comprehensive GenAI occupation exposure index that:

1. is based on a two-tier human assessment (workers in a given occupation and labour market experts);
2. is adapted to the national classification of occupations in Poland (the Polish Classification of Occupations and Specialisations [KZIS]), and, most of all, is based on the Polish linguistic descriptions of the tasks; and

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3. covers all occupations on a six-digit International Standard Classification of Occupations (ISCO) level, that is a total of 2500 occupations (to be estimated by ChatGPT4).

Such an index enables a reliable estimation of the impact that GenAI has on the Polish labour market and calculate the population whose occupation is 'under threat' from the constant development of AI tools. This makes it possible to prepare macroeconomic forecasts to be used in estimating the general impact of GenAI on Polish economy. Additionally, the intention of the project's authors is to publish these data so that every economically active person may learn the forecast for their occupation and use this knowledge in further planning their careers.

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