

NEW TECHNOLOGIES, POTENTIAL UNEMPLOYMENT AND NESCIENCE ECONOMY IN THE RUSSIAN REGIONS

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The use of unmanned technologies (robots as autonomous systems) can cause a decrease in employment rate and inequality growth (Brynjolfsson, McAfee 2014; Chang, Huynh 2016). It was shown on an example of local labour markets of the USA in 1990-2007 (Acemoglu and Restrepo 2017) that an increase in the number of industrial robots by one (per 1,000 employed) leads to a decrease in the proportion of employed by 0.18-0.4 percentage points, and wages - by 0.25-0.5 percent, taking into account the impact of imports, routine work, the introduction of ICT and a number of other control variables.

For large territorially heterogeneous countries (Russia, the United States, China, Brazil, etc.), the social consequences of technological changes will have a pronounced geographic (regional and urban) specificity (Berger, Frey 2015; Berger, Frey 2016), leading to large-scale migrations and changes in the socio-economic space. In regions and cities with high risks of robotization, it is possible to form new old industrial and "old-service" regions with a high level of social tension. Therefore, there is actually a new area at the intersection of regional analysis and foresight studies as part of the geography of innovation.

The analysis of compensation mechanisms and the results of previous empirical studies do not give a clear understanding of these negative social consequences (Vivarelli 1995; Zemtsov 2017). Historically, new technologies have created more jobs than cut. There are several adaptation mechanisms of the labour market: new products, new industries creation, and transition from routine to more complex, responsible and creative tasks for humans. We can distinguish several human features that modern robots are difficult to replace: creativity and entrepreneurship; STEM; social interaction; adaptability; responsibility and management; mentoring. Therefore, there are several methods to determine non-automatable activities.

Based on the internationally comparable methods (Frey and Osborne 2013; Manyika et al. 2017), it was estimated that about 44% of the workers in Russia can be replaced by robots (automated), which is lower than in most countries, except Great Britain (35%), Finland (35%) and the Netherlands (40%). Industries with high social and creative intelligence (education, public administration, finance) have high proportion in employment in Russia, there is high rate of ICT diffusion, and there is a large informal sector of economy. In the regions, specializing in the manufacturing industry, automation potential is higher than 46%; it is less than 42% in less developed regions. Demand for highly skilled labour force grows in Russia in the 2000s; there was an employment change from more to less vulnerable (to automation) industries. But these estimates do not take into account the informal sector of the economy, the unemployed and those who are engaged in inconstant labour.

Automation does not directly lead to an increase in unemployment (Arntz et al. 2016). But long-term mismatch between the exponential increase in automation rate and the compensating effects of retraining and new jobs creation is possible. Some people will be not ready for life-long learning, development and creation of new ideas, technologies and products, competition with robots, and accordingly there is a possibility of their social exclusion in the future. In Russia, the process can have a more significant scale, since the speed of diffusion of innovation at the initial stage is limited (except for Moscow and St. Petersburg), but later new technologies are introduced rapidly in most regions (Baburin and Zemtsov 2017). Moreover, in the event of a serious crisis, the current model of the labour market in Russia (Gimpelson and Kapelyushnikov 2015) will slow down the industrial modernization, increase inequality among the employed, deprive workers of institutionalized social protection and maintain the uncertainty of their situation. In other words, the existing model can exacerbate the existing risks of technological exclusion for citizens in the future.

The term "nescience economy" and the corresponding evaluation methodology were proposed to describe these processes. Based on the assessment of workplace automation, we estimated the proportion of the workforce, including the unemployed and the informal sector, who may be potentially susceptible to technological exclusion. The higher the risks (scale) of nescience economy in the regions, the more difficult social disparities can be in the future.

About 50% of labour forces in Russia can be excluded from modern economic activities. The sources of income of these citizens are unclear, but unconditional income introduction is

increasingly being discussed. In some regions the share of potentially excluded working citizens in the population is more than 55%: Ingushetia, Chechnya, Nenets autonomous region. In these regions, a high level of potential exclusion is combined with a low level of potential automation, that is, a growing discrepancy between labour productivity and, accordingly, budget revenues, and potential social risks and costs, will add to the current socio-economic problems.

On the basis of the proposed econometric model, a number of measures are described to reduce the threats, which includes the introduction of continuous learning systems, the formation of a network of entrepreneurial universities, reducing investment risks, involving the population in entrepreneurship and improving the quality of the information and communication infrastructure.

Keywords: technological unemployment, diffusion of innovations, new technologies, automation, ICT, R & D, innovation, Russian regions

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