

Polovinkin Valery Valerievich

master's degree student

Solozhenkina Elizaveta Evgenievna

master's degree student

ITMO University

Saint Petersburg

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THE IMPACT OF AUTOMATION ON LABOUR PRODUCTIVITY AND EMPLOYMENT STRUCTURE IN THE MODERN ECONOMY

***Abstract:** this article examines the impact of automation on labour productivity and employment structure in the modern economy. It shows that the adoption of automated equipment and digital technologies enhances operational efficiency, accelerates processes, reduces costs, and improves the allocation of labour resources. At the same time, technological adoption is reshaping the labour market by reducing demand for routine occupations and increasing demand for workers with engineering and digital competencies. It is concluded that the long-term effects of automation depend on the effectiveness of technology implementation.*

***Keywords:** automation, labour productivity, employment, the labour market, robotisation, digitalisation of manufacturing.*

Половинкин Валерий Валерьевич

магистрант

Соложенкина Елизавета Евгеньевна

магистрант

ФГАОУ ВО «Национальный исследовательский университет ИТМО»

г. Санкт-Петербург

ВЛИЯНИЕ АВТОМАТИЗАЦИИ НА ПРОИЗВОДИТЕЛЬНОСТЬ ТРУДА И СТРУКТУРУ ЗАНЯТОСТИ В СОВРЕМЕННОЙ ЭКОНОМИКЕ

Аннотация: в статье рассматривается влияние автоматизации на производительность труда и структуру занятости в современной экономике. Показано, что внедрение автоматизированного оборудования и цифровых технологий повышает эффективность работы, ускоряет процессы, снижает затраты и улучшает распределение трудовых ресурсов. В то же время внедрение технологий изменяет рынок труда, снижая спрос на обычные профессии и увеличивая спрос на работников, обладающих инженерными и цифровыми компетенциями. Сделан вывод о том, что долгосрочные эффекты автоматизации зависят от эффективности внедрения технологии.

Ключевые слова: автоматизация, производительность труда, занятость, рынок труда, роботизация, цифровизация производства.

In the modern economy, labour productivity growth is increasingly associated with the digital transformation of production and management processes. Traditional responses to labour shortages and rising costs include expanding recruitment, raising wages, upgrading equipment, and improving work organisation. However, expanding the workforce alone no longer guarantees sustainable results under demographic constraints and tight labour market conditions. In this context, automation has become an important means of increasing output without a proportional increase in staff numbers. At the same time, the academic literature emphasises that automation involves more than simply replacing human labour with machines: it reshapes employment structures, alters skill requirements, and redistributes work functions [3]. Despite extensive discussion of automation in the literature, the combined impact of automation on both labour productivity and employment structure in the context of the Russian economy remains insufficiently explored.

In Russian academic literature, automation is viewed as part of the broader process of technological modernisation of the economy, affecting the labour market as a whole. Its impact is twofold. First, automated systems reduce the share of manual and routine tasks, minimise errors, accelerate standard procedures, and ensure consistent

quality. Second, the adoption of automated systems generates demand for new categories of workers, including automation specialists, software engineers, robotic system operators, service engineers, and personnel capable of operating at the intersection of technology, data, and management [4]. Automation should therefore be examined from two interrelated perspectives: as a driver of economic efficiency and as a factor reshaping employment structures. The mechanism through which automation affects labour productivity and employment structure is illustrated in Figure 1.

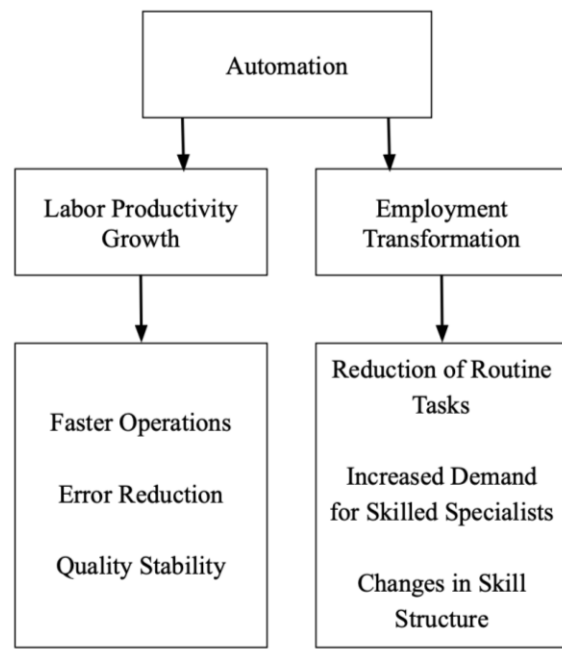


Fig. 1. Mechanism of the impact of automation on labour productivity and employment structure

Figure 1 demonstrates the dual impact of automation, reflected in both increased labour productivity and changes in employment structure. These processes are interrelated: efficiency gains are achieved through the redistribution of work tasks and rising skill requirements for workers.

In Russia, technological automation is developing amid a severe labour shortage. According to the Bank of Russia, labour productivity increased in nearly half of the industrial enterprises surveyed in 2024. The main drivers of this growth were equipment upgrades, cited by 67% of respondents, and business process optimisation, reported by 42% of enterprises; a further 35% identified automation as a productivity-

enhancing measure [1]. The same study notes that the unemployment rate fell to 2.5% in 2024, while the potential for extensive employment growth had been largely exhausted. Consequently, automation in the Russian economy increasingly serves as a means of compensating for labour shortages.

The scale of this transition is reflected in technological development statistics: in 2024, nearly one quarter of Russian organisations – more than 15,000 enterprises – used advanced manufacturing technologies to automate various production processes [2].

The expansion of industrial robotisation provides further evidence of this trend. According to available data, by 2024 the number of industrial robots in use in Russia's manufacturing sector had exceeded 20,000 units [6]. Robot density, according to the institute's calculations based on Rosstat data, increased from 19 robots per 10,000 industrial workers in 2023 to 29 in 2024. The dynamics of industrial robotisation are illustrated in Figure 2.

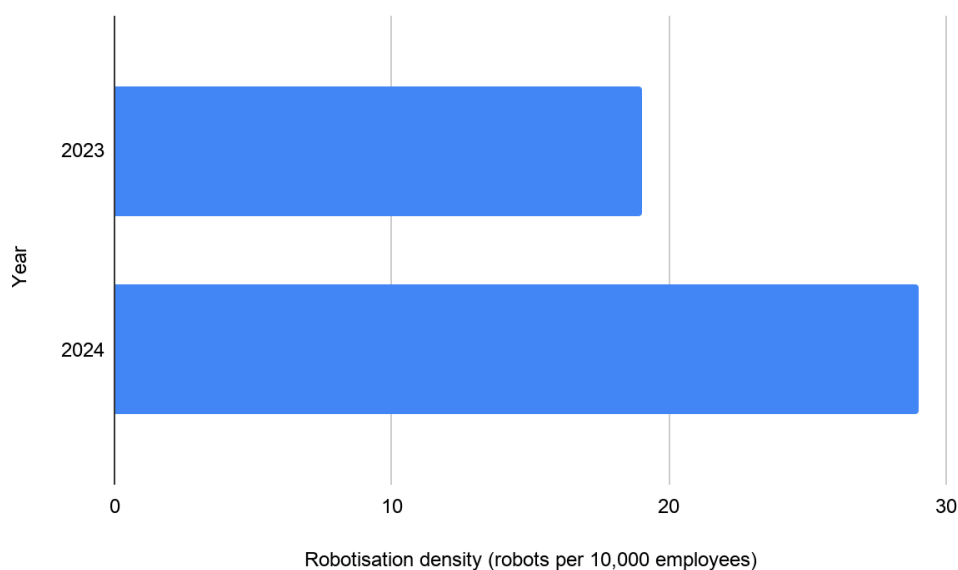


Fig. 2. Trends in robot density in Russian industry (robots per 10,000 employees)

Figure 2 indicates that the level of automation in Russian industry is increasing rapidly. Although absolute figures remain below those observed in the most technologically advanced industrial economies, the trend points to a gradual transition towards a more technology-intensive production model. The growth in robot density reflects the

expanding adoption of automated solutions and creates conditions for further increases in labour productivity under constraints in labour supply.

However, the impact of technological automation on employment should not be interpreted simplistically as a direct reduction in jobs. Rather, automation more often leads to a redistribution of work functions and a transformation of the occupational and skills structure of the workforce. The rapid expansion of industrial robotics has generated growing demand for highly qualified specialists. Company executives report persistent shortages of engineers, particularly design engineers, automation engineers, and related technical specialists [5].

In summary, automation is one of the key drivers of labour productivity growth and changes in employment structure. Its importance is particularly pronounced in the context of labour shortages, technological competition, and the transition to a more intensive model of economic growth. Further research may focus on a more precise assessment of sectoral differences in the effects of automation, as well as on identifying which occupational groups benefit most from technological transformation and which require the greatest support for adaptation.

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