

DIGITALIZATION AND ITS DUAL IMPACT: EVIDENCE ON PRODUCTIVITY AND EMPLOYMENT IN OECD COUNTRIES

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Abstract: This article explores the dual impact of digitalization on productivity and employment across OECD countries. Using panel data from 2005 to 2022, it analyzes how digital indicators—such as ICT investment, broadband penetration, and digital skills—affect labor productivity and employment rates. The results reveal that digitalization significantly enhances productivity but has a mixed impact on employment. While high digital skills improve labor market outcomes, automation-related ICT investment may reduce demand for certain job categories. The findings highlight the importance of complementary policies, particularly in education and workforce reskilling, to ensure inclusive growth in the digital era.

Keywords: Digital economy, productivity, employment, OECD, ICT investment, digital skills.

Introduction

Digitalization has become a core driver of economic transformation in OECD countries, reshaping productivity dynamics and labor markets. Technologies such as broadband internet, artificial intelligence (AI), and ICT infrastructure have significantly improved operational efficiency, innovation capacity, and value creation. These developments have led to measurable gains in labor productivity, especially in sectors that effectively adopt digital tools.

However, the employment effects of digitalization are more ambiguous. While new job opportunities emerge in digital sectors and remote work expands flexibility, automation and AI adoption risk displacing routine and mid-skill jobs. This creates a dual impact: productivity improves, but employment outcomes become increasingly unequal.

This article analyzes panel data from 2005 to 2022 to examine how key digital indicators—ICT investment, broadband access, and digital skills—affect productivity and employment across OECD countries. It aims to uncover whether digitalization fosters inclusive

growth or deepens labor market disparities, and what policy responses are needed to balance innovation with social equity.

Literature Review

A growing body of research explores how digitalization affects productivity and employment. Brynjolfsson and McAfee (2014) highlight that digital technologies—such as automation and data analytics—can significantly boost productivity through efficiency gains and innovation [1]. However, these same technologies often lead to labor displacement, particularly in routine-intensive occupations.

David Autor, Frank Levy, and Richard Murnane argue that technological change is skill-biased, benefiting high-skilled workers while reducing demand for middle-skilled occupations [2]. Supporting this, OECD reports show that while digitalization enhances firm-level productivity, it also contributes to labor market polarization, where high- and low-skilled jobs grow at the expense of middle-skilled ones [3].

Van Ark (2016) discusses the “productivity paradox,” noting that despite widespread digital adoption, productivity growth has been uneven across sectors [4]. Bessen (2019) adds that the employment impact of AI depends on demand-side responses, not just automation potential [5]. Similarly, the ILO (2021) emphasizes the transformative, yet uneven, effects of digital labor platforms on global employment patterns [6].

Despite these insights, a gap remains in country-level analyses that jointly assess digitalization’s effects on productivity and employment across OECD countries. This article aims to address this gap by offering a unified empirical framework.

Methodology

This study uses panel data from 2005 to 2022 for 30 OECD countries. The key indicators include:

- **Dependent Variables:** Labor productivity (GDP per hour worked) and total employment rate.
- **Independent Variables:** ICT investment (% of GDP), broadband internet penetration, and digital skills level (as reported in OECD Digital Economy Outlook).
- **Control Variables:** Education level (e.g., tertiary attainment), R&D expenditure, gross capital formation, and trade openness (exports + imports as % of GDP).

A fixed-effects regression model is employed to control for time-invariant heterogeneity across countries and focus on within-country variation. The econometric specifications are as follows:

Equation 1: Productivity model

$$\text{Productivity}_{it} = \alpha_i + \beta_1 * \text{ICT}_{it} + \beta_2 * \text{Broadband}_{it} + \beta_3 * \text{Skills}_{it} + \gamma * X_{it} + \mu_t + \varepsilon_{it}$$

Equation 2: Employment model

$$\text{Employment}_{it} = \alpha_i + \delta_1 * \text{ICT}_{it} + \delta_2 * \text{Broadband}_{it} + \delta_3 * \text{Skills}_{it} + \theta * X_{it} + \mu_t + v_{it}$$

Where:

- i denotes country, and t denotes year
- X_{it} represents control variables
- α_i are country fixed effects
- μ_t are time fixed effects
- ε_{it}, v_{it} are error terms

This approach allows the study to identify how within-country changes in digital indicators over time affect productivity and employment outcomes.

Results and Analysis

The regression results reveal a strong and statistically significant positive relationship between ICT investment and labor productivity ($\beta = +0.42, p < 0.01$). This confirms that digital infrastructure and technological capital play a critical role in enhancing efficiency within OECD economies. Investments in digital technologies facilitate automation, reduce transaction costs, and improve resource allocation, particularly in industries with high information intensity. The findings support prior literature suggesting that digitalization accelerates total factor productivity, especially when combined with innovation-friendly environments.

Broadband penetration also shows a positive association with productivity ($\beta = +0.30, p < 0.05$), indicating that widespread internet access is a vital enabler of digital transformation across firms and public services. Digital connectivity improves information flows, enables teleworking, and fosters the diffusion of digital tools among SMEs, contributing to aggregate productivity growth.

Digital skills—measured by indicators of adult digital literacy and ICT training—emerge as a key determinant of both productivity ($\beta = +0.35, p < 0.01$) and employment ($\alpha = +0.28, p < 0.01$). Economies that invest in upskilling their workforce experience better labor market integration and adaptability to digital tasks. This aligns with the theory of skill-biased technological change, where human capital complements digital adoption.

However, the impact of ICT investment on employment is notably different. The coefficient for ICT investment in the employment model is negative and statistically significant ($\alpha = -0.18, p < 0.1$), suggesting that in the absence of adequate reskilling policies, increased digital capital may lead to labor substitution. Sectors characterized by routine, codifiable tasks—such as manufacturing, administrative support, and transport—are particularly vulnerable to automation, leading to job displacement or stagnation in employment growth.

The coefficient for broadband penetration on employment ($\alpha = +0.10$) is positive but not statistically significant, implying that connectivity alone is insufficient to generate job growth unless paired with digital entrepreneurship, innovation ecosystems, or remote work infrastructure.

Table 1: Summary of Regression Coefficients

Variable	Productivity (β)	Employment (α)
ICT Investment	+0.42***	-0.18*
Broadband Penetration	+0.30**	+0.10
Digital Skills	+0.35***	+0.28***

(* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$)

In summary, while digitalization acts as a catalyst for productivity, its effect on employment is dual and conditional. The analysis underscores the importance of targeted policies—particularly lifelong learning programs, labor mobility support, and inclusive digital infrastructure—to ensure that the gains from digital progress translate into broad-based labor market benefits. Without such measures, digitalization risks deepening inequality and creating structural unemployment in low-skill segments.

Discussion

The results of this study corroborate a significant body of literature that recognizes digitalization as a powerful engine of productivity growth. The positive and statistically significant relationship between ICT investment, broadband penetration, and labor productivity suggests that digital technologies contribute to more efficient production processes, enhanced communication flows, and greater innovation capacity within firms. These effects are particularly pronounced in knowledge-intensive and high-tech industries, where digital tools integrate seamlessly with capital and human expertise. These findings align with the views of Brynjolfsson and McAfee, who emphasize the role of digital technologies in ushering in a "second machine age" of accelerated productivity growth [1].

However, the employment results highlight a more nuanced and concerning dimension. The evidence suggests that while higher digital skills improve labor market performance, ICT investment alone has a neutral or even negative impact on employment, particularly in sectors with a high degree of routinization and task automatability. This supports the arguments made by David Autor, Frank Levy, and Richard Murnane, who found that technological change often displaces middle-skill jobs, leading to labor market polarization [2]. The disparity between productivity gains and employment outcomes also mirrors the so-called "productivity-employment paradox," where economic output grows without a commensurate rise in job creation.

This dual effect of digitalization raises important policy implications. First, it underscores the critical need for **targeted investment in human capital**. Digital skills must not be limited to a small elite; they should be accessible to the broader workforce through lifelong learning, vocational training, and digital literacy initiatives. OECD countries that have made such investments—such as Finland and Estonia—are better positioned to manage labor market disruptions while maintaining competitive productivity levels.

Second, the findings call for the design of **adaptive and inclusive labor market policies**. Governments must proactively support displaced workers through unemployment insurance, mobility assistance, and career transition services. Reskilling and upskilling programs should be aligned with market demand, particularly in growing sectors like green technology, digital health, and e-commerce. This approach not only mitigates the risks of unemployment but also fosters new forms of job creation in emerging industries.

Third, the study highlights the value of **public-private partnerships** in the diffusion of digital technologies. Policies that support the digitalization of SMEs, rural enterprises, and non-tech sectors can reduce the digital divide and create more balanced economic development. For example, subsidizing digital infrastructure and cloud services for small firms can enhance productivity without triggering large-scale job losses.

Conclusion

Digitalization in OECD countries has undeniably contributed to significant productivity growth, particularly through the integration of ICT, broadband expansion, and enhanced digital skills. However, its impact on employment remains multifaceted. While it generates high-skilled jobs, drives innovation, and fosters efficiency in various sectors, it also has the potential to displace workers, especially in industries vulnerable to automation and technological disruptions. This dual impact underscores the importance of supportive policies to ensure a balanced transition.

To fully harness the benefits of the digital economy, policymakers must focus on comprehensive strategies that include investment in education, reskilling programs, and the promotion of labor market flexibility. These policies will help mitigate the adverse effects on vulnerable worker groups while facilitating the growth of new, high-value employment opportunities.

References:

- [1] Brynjolfsson, E., & McAfee, A. (2014). *The Second Machine Age*. W. W. Norton & Company.
- [2] Autor, D., Levy, F., & Murnane, R. (2003). "The Skill Content of Recent Technological Change." *Quarterly Journal of Economics*, 118(4), 1279–1333.
- [3] OECD. (2020). *Digital Economy Outlook 2020*. OECD Publishing.
- [4] Van Ark, B. (2016). "The Productivity Paradox of the New Digital Economy." *International Productivity Monitor*, 31, 3–18.
- [5] Bessen, J. (2019). "AI and Jobs: The Role of Demand." NBER Working Paper No. 24235.
- [6] International Labour Organization (ILO). (2021). *World Employment and Social Outlook: The role of digital labour platforms in transforming the world of work*. ILO.