

The 3rd International Conference on Economics and Social Sciences
Innovative models to revive the global economy
October 15-16, 2020
Bucharest University of Economic Studies, Romania

**Skill Needs in Romania
in the Context of Technological Change**

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DOI: 10.2478/9788395815072-099

Abstract

This paper presents the results of an analysis of skill needs in Romania, using available statistical datasets from main statistical institutions. Romania faces high rates of unemployment, and employers report skills shortages limiting firms' growth. Using data from major statistical institutions, we aim at shedding light on the type of skill needs of the economy, especially in the context of technological change, and at providing insights into labour market dynamics and employers' needs, especially in terms of technological diffusion. A rigorous descriptive analysis of the characteristics of skill needs in Romania is implemented. The findings show that Romania was confronted with a labour market crisis before the Covid pandemic, and the ITC sector suffered the most, as it was confronted with some of the highest skills shortages in Romania. Whereas Romanians have the least digital skills in Europe, socio-emotional and digital skills are the most demanded skills across all industries and occupations. Granular analysis of skills demanded by sector is conducted, with an accent on ICT, and useful to policy makers to inform training needs and career information provided.

Keywords: skill needs, ICT sector, Romania, statistical analysis.

JEL Classification: J24, J23, J44

1. Introduction

During the last years, the Romanian economy experienced relatively high growth rates that allowed it to converge to the overall economic development in the EU. Romania's real GDP growth averaged 4.5 percent per year, more than double than the average in the EU-28 during the same period. Romania's

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population continued to diminish, and with it, the available workforce. Over the last years, employment has become progressively intense in services, despite the growth of employment in industry. The industry became a significant job creator, but its structure changed: the textile and *lohn* industry declined, while the auto-moto and vehicles industry increased. New types of businesses and public and private services emerged and developed. Economic growth concentrated more of the workforce into higher value-added activities, and away from agriculture, which was for a long period a safety net for households. Looking forward, the technology is about to influence the nature of jobs in some specific industries (Acemoglu and Autor, 2011; Autor, 2015), and the task content of certain occupations globally. Low fertility, complemented by the out-migration of almost 3.5 million Romanians living abroad in 2018, has resulted in negative population and labour force growth. Considering this, according to the National Bank of Romania, unavailability of skilled staff and lack of skilled personnel is regarded as a significant barrier to development for firms at the national level (NBR, 2017).

In this analysis we focus on Romania, which is one of the fast-growing economies in the EU and aim to showcase in-depth all challenges and developments shown above, considering the need for skills in the ICT sector. Whereas it is well known that the competitiveness of Romania will depend on its capacity to adapt to the technological changes considering the Fourth Industrial Revolution, the understanding of the skill needs in the economy is of paramount importance for informing future analysis in the field, as well as future public policies.

2. Problem Statement

The impact of technology is becoming increasingly complex, focusing on the debate regarding the effect of technological changes on the future of labour, employment and skills. The initial studies have estimated negative effects that could vary from 57% for the jobs in OECD countries, 73% for the jobs in Asia, to 85% for the jobs in Ethiopia (Frey and Rahbari, 2016). Brynjolfsson and McAfee (Brynjolfsson and McAfee, 2014) considered technological change and innovation to be the main causes of unemployment. Subsequently, researches focused on the innovation-employment relationship and the qualitative impact on the labour force competences (Autor et al., 1998; Chennells and van Reenen, 1999).

These findings have been partially rejected by recent studies that estimate moderate effects. Arntz, Gregory and Zierahn (Arntz et al., 2004) estimate the impact of automation on US jobs and note that only 9% of jobs are exposed to the risk of automation.

Structural analysis of job changes in 12 Asian economies by ADB (Asian Development Bank, 2018) suggests that the effects of income growth on demand outweigh the negative impact of technology, which leads to the positive net growth in employment and can help generate jobs in other industries. Other studies (Autor and Salomons, 2017; MGI, 2017) show that if increased productivity generated

by technology has the effect of reducing employment within an industry, this increase generates employment in other sectors and industries.

More recently, some studies have analysed the effect of the gap in technology adoption, showing that technology adoption is determined not only by technological aspects but also by economic efficiency. The technology will not be produced as it is financially more profitable (Asian Development Bank, 2018). Other studies in the field analyse the effects that technology will have on work. New jobs will require higher cognitive and soft skills, and will mainly involve cognitive and non-repetitive activities, especially in the field of services (PwC, 2019). In fact, it was found that the demand for jobs that require non-routine cognitive tasks such as researchers or managers has grown faster than jobs that require routine manual tasks such as line assemblers (Asian Development Bank, 2018).

Also, studies show that emerging new jobs will increasingly require higher-level skills (Frey and Osborne, 2013; Khatiwada and Veloso, 2019) and suggest that the risk of automation is higher in jobs with low salaries and low skills. Thus, it is necessary to prepare the current and future workforce adequately for the transition to highly qualified jobs.

3. Aims of the Research

The main purpose of this research is to highlight the type of skill needs in the economy, especially in the context of technological change, and to provide insights into Romanian labour market dynamics and employer needs, especially in terms of technological diffusion. The main hypothesis of the analysis is based starting from the prevalent opinion crystallized over the past years in the field that unless rapid structural reform measures are adopted, the technological change will widen the digital gap between the poorer and less educated and the richer and more educated consequently, and between the rural and the urban parts of the country. Considering that workforce reskilling and upskilling has the potential to diminish this gap and to smoothen the transition of Romania to the Fourth Industrial Revolution, the current analysis aims to outline the current state of play regarding the demand for skills, especially in the ICT sector, by using existing quantitative and qualitative data. In order to do so, the analysis tries to answer to the following research questions:

1. What jobs and skills are going to be in demand in Romania in the medium term?
2. How is the ICT sector evolving in Romania?
3. What is the digital skill level of the Romanian labour force?

4. Research Methods

Using macro data from major statistical institutions (mainly Eurostat and the National Institute for Statistics, but also the National Bank of Romania), we aim at shedding light on the type of skill needs in the economy, especially in the context of technological change, and at providing insights into labour market dynamics and

employer needs, especially in terms of technological diffusion. A rigorous descriptive analysis of the characteristics of skill needs in Romania is implemented.

5. Findings

The demand for skills in Romania was influenced by various factors, ranging from the brain drains to weak correlation between education outcomes and labour market needs. High rates of inactivity recorded by the working-age population (15-64), especially by vulnerable groups and women, lack of correlation between education and labour market needs, high levels of early school leaving and the lowest participation in lifelong learning in the EU (Eurostat, 2019), important brain drains (World Bank, 2018), all shape the skills panorama in Romania, contextualizing the skill demand and skill mismatch on the labour market. Other contributing factors are low public spending on active labour market measures and lack of transparency regarding recruitment in public authorities and state-owned companies, as jobs openings are not advertised in PES matching services.

Skills shortages are major barriers in firms' operating environment, hampering corporate investment activity and increasing investment gaps, as finding a qualified workforce is among the top five concerns for Romanian firms (EIB, 2019). Unavailability of skilled staff was regarded as a major barrier to development by 42 percent of non-financial corporations in Romania, while lack of skilled personnel affected especially larger firms (60 percent) and small and medium enterprises (42 percent). At a sectoral level, skill shortages affected to a larger degree companies from the industrial sector (51 percent), while companies in services and agricultural sectors were influenced to a lesser extent (40 percent) (NBR, 2019).

5.1. Skills in demand in Romania

There is a consensus on the skill problems facing Romania. Policy documents like the National Strategy for Employment 2014–2020, the National VET strategy 2016-2020, Lifelong learning strategy 2015-2020, Strategy for tertiary education, Strategy for the modernization of educational infrastructure draw attention on the risks associated with the lack of skills or skills uncorrelated with labour market requirements, for the implementation of economic growth strategies.

Romania was confronted with a major skilled labour force crisis before the Covid-19 pandemic. Skills were not evolving in line with the needs of expanding economic sectors, as 81 percent of employers declared having difficulties filling job vacancies. The labour market relevance of vocational education and training outcomes is still limited. Some steps have been taken to recognize learning outside formal education and training and to steer the new dual vocational education and training, yet pressing challenges remain. Other important barriers are: (i) the limited offer of non-formal education and training; (ii) limited participation in vocational qualification programmes for people with a low level of qualifications;

(iii) insufficient coordination between stakeholders; and (iv) insufficient system monitoring, quality assurance and staff training (COM, 2019a).

Skilled workers and administrative officials were highly demanded on the labour market. As it can be noticed from the table below, the lowest demand for labour force was registered in the agricultural field. The vacancies analysis provides an understanding of sectors with higher requests and an indicator of particular skills required in the near future. A response to this issue can be increased participation in education and vocational training and lifelong learning, with special emphasis on digital skills.

Unfortunately, Romania has the lowest participation rate in lifelong learning in the EU, because of attitudinal and systemic problems (Figure 1). As it can be noticed, there is a prevalent self-sufficiency mentality (especially at the level of people at risk on labour market, aged over 40), who believe that their level of skills is perfectly matched to their job description), and that continuous education and training plays little role in job promotion and fulfilling the job description tasks (Balica et al., 2010). Moreover, the LLL system is not adapted to employers' needs generating quality and relevance problems as the education outcomes are not relevant for the labour market needs (MEC, 2015). As noticed in the graphs below, participation to life-long learning is very low, as this is generally not compensated in wages or career progress or valued at the personal level. In the case of ICT skills, in 2018, only 5 percent of the Romanian employers provided training opportunities to their employees, compared to 23% in the EU.

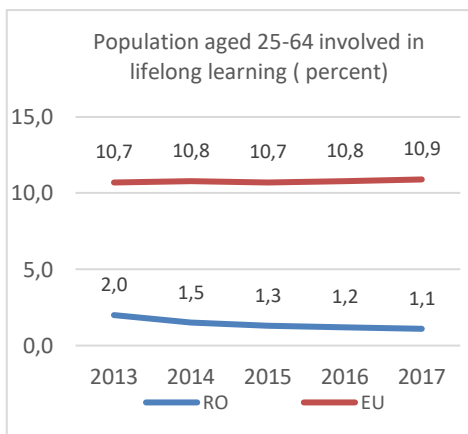


Figure 1. Lifelong learning, 2013-2017

Source: Own computations based on Eurostat data

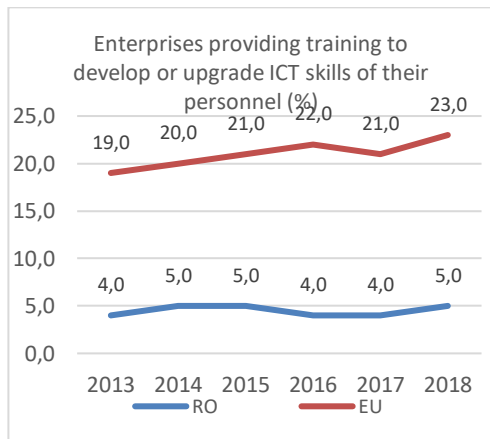


Figure 2. Enterprises providing ICT training, 2013-2018

Source: Own computations based on Eurostat data

5.2 ICT sector in Romania and digital performance

Changes in the occupational structure of the Romanian labour market reflect how it is impacted by demand, and what types of skills are needed. The most significant change is in the ICT sector in Romania which is one of the most dynamic sectors in the country, developing progressively over the past years. This is also a reflection of the trend that the longer-term structural shift is towards a service-orientated economy. The number of companies active in the information and communication sector in Romania grew significantly over the last ten years from 26,482 enterprises in 2011 to 37,254 enterprises in 2017 (Eurostat, 2020). In the context of economic growth, the business evolved in the same rhythm from RON 26 billion in 2010 to RON 51.1 billion in 2018. By far, the ICT sector becomes a high contributing sector to Romania's GDP (5.5% in 2017) (NBR, 2017), with almost 150,000 people employed. Still, according to the EC, in 2017, Romania had the lowest share of ICT specialists in total employment (2.1%). Considering the existing vacancies in the ICT sector, the situation suggests that the gap between demand and supply might be widening, and that the potential of people with ICT skills might remain unexploited.

Whereas the ICT sector is thriving, Romania's digital performance lags. According to DESI (COM, 2019b), Romania is on the last places in Europe accompanied by Bulgaria.

Industry 4.0., digital transformation and innovation are at the heart of the EU's future development for the next 10 years. Industry 4.0., combining communication networks, automation, robots, 3D printing, AI, control systems and automated cars, will significantly impact on the economy, leading to an unprecedented level of automation and operational independence. Technology may replace some jobs, but can also continue to enable job growth. Information and communication technology made possible the spectacular growth of the ICT sector in Romania, which is now confronted with important labour and skills shortages due to the incapacity of the education system to generate a skilled workforce (COM, 2019b).

Advances in robot technology and artificial intelligence have stoked global fears that many jobs may disappear, and different studies (Frames, 2019; PwC, 2019) point to the fact that Romania, as East European Country, shares one of the highest risks of automation replacement in the EU (more than 60 percent). According to the International Federation of Robotics, Romania currently has 11 robots at 10,000 industrial workers. By comparison, in Poland there are 28 robots/10,000 employees, and in Hungary 57 robots/10,000 employees.

Considering the higher job vulnerability of routine tasks (Frey and Osborne, 2013; Nedelkoska and Quintini, 2018), these transformations are considered to affect production lines in manufacturing sector, but also higher-skill professions such as journalism, accounting, tax and management consultancy, legal and other advisory, eventually even education (COM, 2016). Other opportunities will emerge especially in knowledge-intensive sectors, leading to additional labour re-allocation and employment growth in other sectors. Skill mismatches and re-skilling and

up-skilling represent significant barriers to the transfer of workforce across and within sectors (Ryder et al., 2015; UNDP, 2015).

5.3 The demand for digital skills in Romania

According to the European Commission, 90% of jobs need a minimum level of digital competences, and the need for ICT specialists is on the rise (CEDEFOP 2019).

Demand for ICT skills is expected to grow, as ICT labour shortages will increase because the ICT sectors and the digital sector are expected to raise in the next years. Brain drain, outdated teaching methods, outdated learning curricula and low levels of non-cognitive skills contribute to the ICT labour shortage and skill mismatch phenomena (CEDEFOP, 2016). There has been slow progress over the past years, especially in digital skills and the digitization of the economy. The gap between Romania and the EU in terms of skill mismatch, development and skill activation is significant (Figure 3). Also, ICT skill gaps are quite significant, as Romania ranks last place in the EU regarding the individual skills index, computer skills and internet skills (EUROSTAT, 2017). Only 2 percent of employed individuals are working as ICT specialists. Whereas the number of STEM students has doubled over the past few years, the number of teachers has remained the same. There is a significant mismatch between what the market requires and what universities are delivering. Only about 20 percent of the market needs are currently covered, and the provision of ICT training at the firm level remains low (COM, 2019a). Furthermore, even though Romanians are benefiting from ultrafast broadband, broadband networks are underdeveloped in rural areas, with the risk of digital exclusion.

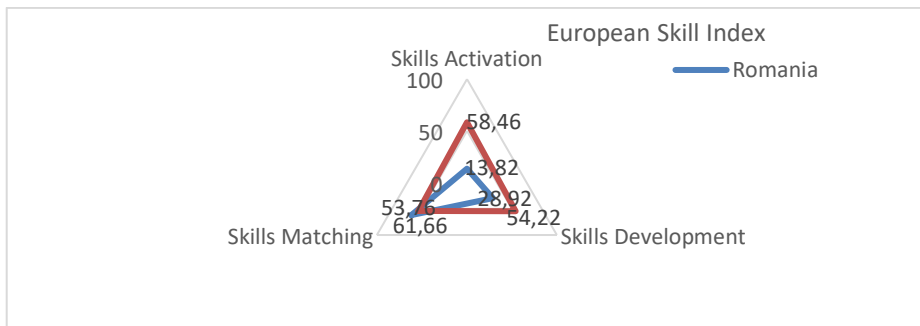


Figure 3. Romania: Skills Panorama Index
 Source: CEDEFOP, Skills Panorama Index, 2016

Lack of adequate soft skills is another cause of skilled workforce deficit, as soft skills are taught neither in the education system, nor in the vocational or training system. Soft skills in high demand are interpersonal abilities and communication abilities, such as lack of professionalism, collaboration and weak team work abilities, and problems related to attention to details, planning and organization.

6. Conclusions

As technology is the main driver of change in the labour market, a skill-based, rather than a degree-based labour market (World Economic Forum, 2019), accompanied by a digitalized labour force should be Romania's focus for the next 10 years. Romania's transition to a higher value-added economy, against the background of exponential technological change, current skills shortages, limited skill anticipation/forecasting capacities can be achieved only by permanently upgrading the skills of employees and by strengthening the vocational education and training system in line with the fast-changing needs in the economy. The desired progress cannot be achieved without a digitalized and adaptive workforce. Therefore, ICT skill training should become a compulsory part of every training curriculum.

The paper also shows that statistical data appears to be a useful complement to more traditional sources of information to study in "real-time" skill dynamics and employer needs. In the future, a more specific analysis of the impact of technology on skill needs in Romania should be conducted at the content level, by intercrossing the current occupation and skill registers at the international and national level, considering the shift from routine to non-routine cognitive jobs.

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