ROMANIA'S JOB MARKET: TRENDS IN JOB OPPORTUNITIES, EDUCATIONAL REQUIREMENTS AND INDUSTRY NEEDS

Andrei ZEGREAN
Bucharest University of Economic Studies, Bucharest, Romania
zegreanandrei20@stud.ase.ro

Mădălina VRABIE
Bucharest University of Economic Studies, Bucharest, Romania
vrabiemadalina17@stud.ase.ro

Abstract
The supply of labor is the primary asset of the economy and the ability to adjust to the challenges of advancing technologies. This study looked into 9,768 job postings for 29,000 open positions in 3,451 companies. The results reveal that the sectoral distribution of job opportunities is headed by Retail & Commerce, with 27.13% of all open positions, underpinning the consumer-driven economy of Romania. The analysis reveals a relatively low level of part-time and project-based open positions and internships, which are even less so, signifying a low requirement for alternative employment structures. More interestingly, educational requirements represent a wide spectrum of opportunities for candidates with varied qualifications. Graduates represent 45.48% of open positions, underlining the demand for higher education in technical and professional areas. However, students have a fair share of accessible opportunities, at 27.85%, and 54.89% for candidates with no qualifications, reflecting the reality that many industries will value experience and on-site learning more than formal qualification.
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1. INTRODUCTION

Given the reconfiguration of the labor market under the pressure of new technological and economic demands, workforce availability and quality have been identified as a key indicator when assessing the attractiveness of a country to investors. This paper will present the supply side of the Romanian labor market by using online job advertisements. Economists and researchers have been increasingly using data from OJA as a complement to traditional labor market information to provide more detailed and timely insights at the regional level. This is by Giambona et al. (2024), Kahlawi et al. (2024), and Colombo et al. (2019). Although OJA data cannot be considered a complete substitute for traditional official labor market

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information, they provide supplementary insights that are comprehensive, detailed at the geographic level, and up-to-date about labor market trends.

This article is a preliminary study of the supply of the Romanian labor market. The academic literature focusses on the link between the job requirements and the tasks associated with the job (Beręsewicz et al., 2024; Acemoglu et al., 2020; Modestino et al. 2020). The disparity between educational attainment and the skills demanded by a job has been a prominent focus of study in the fields of labor and education economics for an extended period. We have three specific objectives. First, we look at the various supplied positions depending on their sector. This provides some implication for macro-economic dynamics. Second, we look at the proportion of part-time and full-time positions. We analyze this distribution taking into account the recent legislative changes: starting in August 2022, Romania's fiscal legislation mandated that for part-time contracts with wages below the gross minimum wage, mandatory social contributions (CAS and CASS) must be calculated based on the minimum wage level, rather than the actual income earned. This measure has been maintained in 2024, with certain exceptions for specific categories of employees, such as pupils, students up to 26 years old, apprentices, persons with disabilities, and other categories specified by law. Third, we analyse the education requirements for the supplied positions. A Deloitte study reveals that 41% of companies face a skills shortage among employees, while 35% struggle to find enough qualified workers (Deloitte, 2023). Adult participation in continuous training programs is essential for developing the skills needed in the labor market. Considering the latest developments in Romania's public employment policies, including the National Strategy for Adult Training 2024–2027, we analyse what employers seek in terms of qualifications.

The article is structured as follows. Section 2 provides a brief literature review. Section 3 discusses the methodology. Section 4 presents the results while section 5 concludes.

2. LITERATURE REVIEW

A substantial amount of literature underlines the correspondence between the level of education and the job requirement. Ideally, the job titles must be matched with the levels of education, where the job tasks are to be executed, which corresponds to the qualification provided by the formal education system. However, the mismatch between education and the requirements of jobs—vertical and horizontal—has been studied at length in labor and education economics. Vertical mismatch occurs when workers have higher or lower education levels than required for their jobs (Heijke et al., 2003). This issue, commonly referred to as "overeducation" or "undereducation," has been linked to negative outcomes such as wage penalties and job dissatisfaction (McGuinness & Sloane, 2011). Studies have extensively documented its incidence, causes, and consequences (Duncan & Hoffman, 1981; Chevalier, 2003).

Horizontal mismatch refers to a situation where the field of study does not align with the job even when the levels of education match. Robst (2007) established that generalist fields such as social sciences and liberal arts had a higher rate of horizontal mismatch compared to specialized fields like engineering or healthcare. This is considered an undesirable phenomenon because it can result in the underutilization of certain human capital, thereby leading to economic inefficiency (Allen & Van der Velden, 2001). Individual educational choices, national education systems, and labour market conditions are some of the important factors that determine mismatch. For example, late academic specialization and strong vocational orientation in education systems determine the rates of mismatch (Wolbers, 2003). Mismatched employees have to bear the consequences in the form of wage penalties, lower job satisfaction, and higher probabilities of job changes (Robst, 2007b; Béduwé & Giret, 2011). The studies apply subjective measures, including employees' subjective fit perceptions, and objective measures, such as statistical coding of jobs' requirements and qualifications (Bender & Roche, 2013). Subjective approaches typically depend on self-reported matches between education and job roles, whereas objective methods rely on standardized classifications such as ISCO.

Standardized taxonomies, such as the International Standard Classification of Occupations (ISCO) and European Skills, Competences, Qualifications, and Occupations (ESCO), have enabled research into labor markets in a more structured manner. These frameworks allow the identification of job roles with skill requirements, enabling detailed regional and sectoral analysis. The larger part of the literature focuses on OJA for timely perspectives on the alignment between the supply of jobs and the required skills. Focusing on diversity in ICT skills, the work of Kahlawi et al. (2024) considered regional skill demand disparities across Italy's regions using the ESCO classification. The research developed significant gaps between the North and the South, and the former was more aligned with the demand for skills. These findings indicate that tailored skill development programs are much needed in order to reduce these regional inequalities. Another study by Giambona et al. (2024) used data from Lightcast, a job analytics platform that scrapes millions of OJAs every day from various sources, including job boards and corporate websites in Italy. The results show large differences across regions. Northern regions like Lombardia and Veneto show higher skill similarities, reflecting a more integrated labor market. On the contrary, more variability was present among skill demands of southern areas since their economies are usually based on several structures. More substantial changes were determined as referring to skill demands connected with the positions involving work with ICT due to extremely fast dynamics of the technologies at stake. These results highlight the need for targeted workforce development strategies that address regional disparities and align labor force skills with the evolving demands of the job market.

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The reviewed literature uncovers the interplay between education and job requirements which may be useful to be analyzed for Romanian job market. These may be influenced by factors such as educational choices or the structure of national education systems. The integration of standardized taxonomies like ISCO and ESCO has enhanced the ability to analyse labour market dynamics more systematically.

3. RESEARCH METHODOLOGY

In the first part of the analysis, we used web scraping techniques. We inspected the web pages to understand the structure of job postings, which are served as JSON responses to the front-end, with identifiable classes or IDs. We identified key elements such as job titles, descriptions, locations, salaries, and company names. We used Python for the process.

```python
class EjobsService:
    Zegrean Andrei *
    def __init__(self):
        self.ejobs_scraper = EjobsScraper()
        self.ejobs_data_manager = EjobsDataManager()
        self.targetare_data_manager = TargetareDataManager()
        self.stats_tracker = ScrapingStatsTracker()

    1 usage   Zegrean Andrei
    def get_new_jobs(self):
        """Recursively fetch sitemaps and extract all job IDs from listing URLs."""
        print("Fetching job IDs from sitemaps...")

        # Fetch the main sitemap
        main_sitemap = self.ejobs_scraper.fetch_sitemap_xml('https://www.ejobs.ro/sitemap-listings-index-ro.xml')

        # Parse main sitemap to get all category sitemaps URLS
        listings_sitemaps_urls = self.ejobs_data_manager.parse_sitemap_urls(main_sitemap)

        # Fetch all category sitemaps and extract job IDs with progress bar
        job_ids = []
        with tqdm(listings_sitemaps_urls, desc="Processing sitemaps", unit="sitemap") as pbar:
            for url in pbar:
                listing_sitemap = self.ejobs_scraper.fetch_sitemap_xml(url)
                job_urls = self.ejobs_data_manager.parse_sitemap_urls(listing_sitemap)
                page_job_ids = [int(url.split('/')[-1]) for url in job_urls]
                job_ids.extend(page_job_ids)
                pbar.set_postfix({"Total Jobs": len(job_ids)})

        print(f"\nUpserting {len(job_ids)},unique: {len(set(job_ids))}, job IDs...")
        self.ejobs_data_manager.upsert_job_ids(job_ids)

    1 usage   new *
    def _process_single_job(self, job) -> bool:
        """Process a single job and return success status."""
        try:
            job_data = self.ejobs_scraper.fetch_job_data(job.ejobs_id)
            self.ejobs_data_manager.process_ejobs_api_job_response(job, job_data)
            return True
        except Exception as e:
            logging.error(f"Failed to process job {job.ejobs_id}: {str(e)}")
            return False
```

FIGURE 1. CODE SNIPPET OF OUR SCRAPING INFRASTRUCTURE
Source: Authors' research

The web scraping process consists of getting a list of all the posted jobs' IDs at the moment of scraping and then fetching the details of each job posting, parsing the data, and storing it in a database. The first part of the process is done by parsing the source site's sitemap recursively, which contains the URLs of

the entirety of the job postings available. The job postings IDs are extracted from the URLs and then used to make sequential API requests to the site's endpoint responsible for serving job posting data. The requests include rate limiting in order to not overload the server. Furthermore, the scraping process was run at low-traffic hours (21:00-05:00 GMT+3) to further minimize any load impact our scraping might have on the server, in alignment with our commitment to ethical scraping practices. Lastly, we store the parsed data in an SQL database for optimised storage and querying.

In the second part of the methodology, we run our analysis in Power BI. We connect our SQL database to Power BI and we remove duplicates, standardize text fields, and filter jobs based on the criteria. Then, we created a dashboard to form interactive visualisations to analyse trends.

4. RESULTS

The results of the webscrapping on E-jobs, one of the main job search websites in Romania, uncovered: 9768 job posts, 29000 total open position in 3451 companies. Bucharest stands out with the largest cluster of job openings, represented by the densest and largest circle. Other cities like Cluj-Napoca, Timișoara, and Iași also show significant job activity with medium to large circles. Smaller towns and rural areas have smaller or fewer circles, indicating fewer job opportunities in those regions. The disproportion between large cities and smaller cities, including rural areas, is well documented in the literature and data analytics, as well as other economic, indicators show the same percentage. Cities offer more employment opportunities because they benefit from greater industrialization, a more developed service sector, and significant foreign investment. In contrast, rural areas are primarily dependent on agriculture and activities with low added value, which result in fewer job prospects, often limited to seasonal or informal work. Studies from the World Bank and Eurostat confirm these patterns, emphasizing the concentration of economic activity in urban centres.

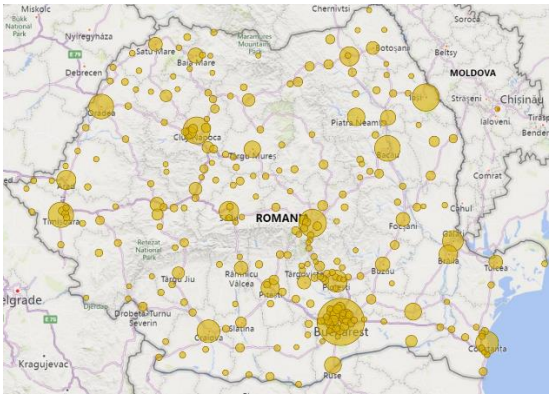

FIGURE 2. OPEN JOB POSITION BASED ON GEOGRAPHICAL DISTRIBUTION
Source: Authors' research

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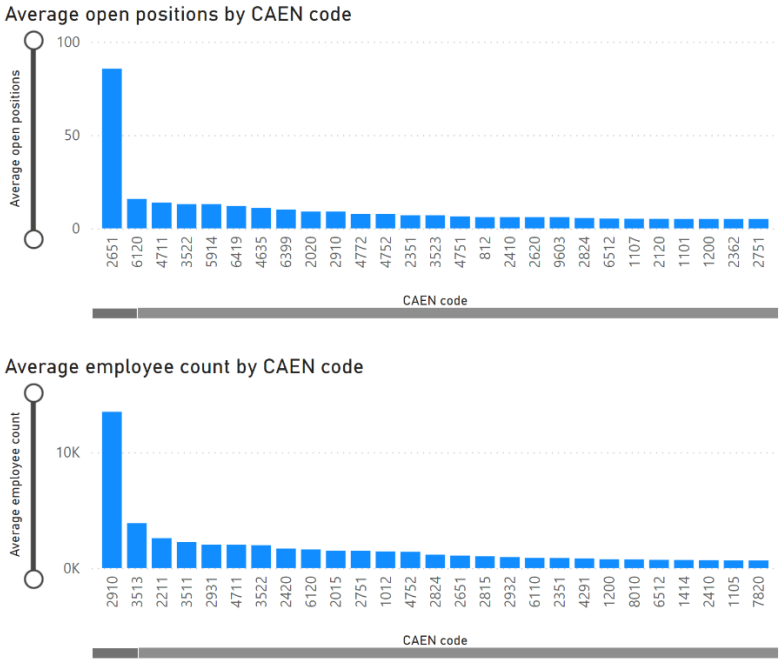

FIGURE 3. AVERAGE OPEN POSITIONS BY CAEN CODE AND AVERAGE EMPLOYEE COUNT BY CAEN CODE
Source: Authors' research

Figure 2 indicates the average number of open job positions in different CAEN (Classification of Activities in the National Economy) codes, where CAEN 2651 is the highest by a significant margin, with close to 100 average open positions. The CAEN code 2651, which pertains to the manufacturing of instruments for measuring, testing, control, and navigation, indicates a high demand for professionals in this sector. This trend highlights a strong industrial need for expertise in producing devices such as sensors, meters, control systems, and navigation equipment, with applications spanning diverse fields, including aeronautics, maritime navigation, environmental monitoring, and automotive testing. The roles associated with this sector require specialized skills in engineering, electronics, and industrial manufacturing, enabling professionals to develop both simple measuring tools and complex systems for applications. This activity plays a significant role in the job market and reflects ongoing technological advancements, aligning with broader trends like innovations in measuring and monitoring devices and an increasing demand for precise instrumentation across scientific and industrial domains. The CAEN code encompasses many activities being one of the largest CAEN classes existing in the dataset. Moreover, the average employee count on already occupied positions, is the highest for CAEN code 2910, far exceeding the others. CAEN Code 2910, representing Manufacture of motor vehicles. This highlights that the motor vehicle manufacturing industry has a significant workforce, likely due to the complexity and scale of activities included in this sector. This code encompasses a variety of manufacturing processes, such as the production of passenger vehicles, trucks, buses, special-purpose vehicles (e.g., fire engines, street sweepers), and

essential components like engines and chassis. These processes require a large and diverse workforce, which explains the high average employee count.

Figure 3 describes a scatterplot showing distinct trends and patterns in the relationship between employee counts and open positions. At lower employee counts, most data points are concentrated below 4,000 employees, with open positions typically ranging from 0 to about 50. As employee counts increase beyond 6,000, there are fewer entities represented, though some still show a moderate number of open positions. A few outliers stand out in the data. One entity has over 200 open positions, despite having a lower employee count. Additionally, some large entities with employee counts between 10,000 and 14,000 have only a small number of open positions, deviating from the general trends.

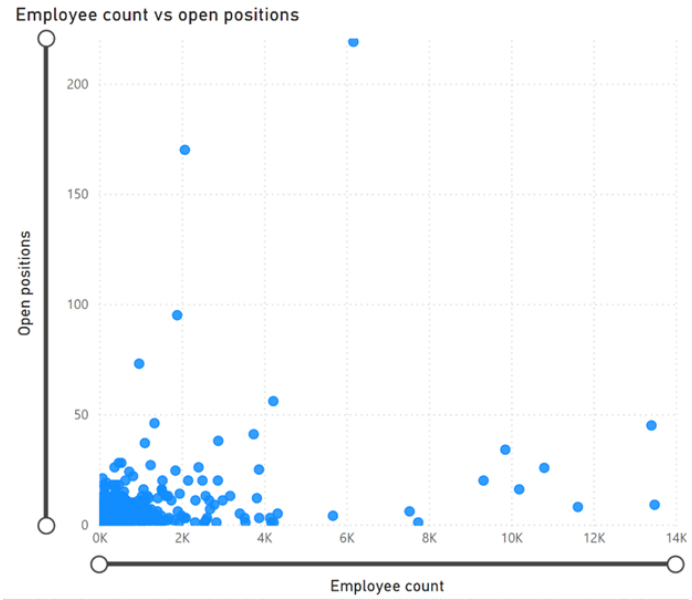

FIGURE 4. OPEN POSITIONS VERSUS EMPLOYEE COUNT
Source: Authors' research

Figure 4 is a Sankey diagram illustrating the distribution of open job positions across various categories. Several conclusions can be drawn from the graph. First, graph starts by categorizing open positions by contract type. The vast majority of positions are full-time (97.27%), indicating that employers are primarily seeking employees for standard working hours. Other categories, such as part-time (19.37%), project-based (5.03%), and internship roles (0.77%), are significantly smaller, reflecting less demand for non-traditional employment structures. This dominance of full-time roles aligns with expectations in a labor market focused on stability and standard employment practices. Part-time and project-based positions may be associated with specialized tasks or temporary needs, while internships cater to students or entry-level professionals.

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Second, Open positions are further segmented by career level. Entry-level roles dominate (67.63%), followed by mid-level (49.76%) and senior-level (16.30%). A small proportion of roles (2.83%) are for managerial or executive positions. The high proportion of entry-level jobs suggests a focus on opportunities for fresh graduates or those entering the workforce. This could also reflect the demand for lower-cost labor or training positions. Senior and managerial roles represent smaller shares, likely because these positions are fewer in number and require more experience and specialization.

Third, the diagram highlights the educational qualifications required. Graduates (45.48%) hold a significant share, followed by students (27.85%) and qualified individuals (17.71%). Interestingly, a substantial portion of jobs (54.89%) is open to unqualified individuals. This diversity in educational requirements indicates that many industries in Romania are open to candidates without formal qualifications, possibly due to the availability of on-the-job training. However, the strong representation of graduate-level positions reflects the importance of higher education for specific roles, especially in technical or professional fields.

Forth, open positions are further distributed across industries, with Retail & Commerce (14.45%) having the largest share. Other prominent industries include Services (7.49%), Call Center & BPO (7.39%), Tourism & Hospitality (6.99%), and the Food Industry (6.73%). This breakdown reveals the dominance of service-based industries, particularly retail and commerce, which are likely fueled by Romania's urbanization and economic growth. Industries like call centers, tourism, and food also reflect the importance of consumer-driven and hospitality sectors in the job market.

Finally, the Sankey diagram categorizes job positions by department. The Sales department (12.10%) has the largest proportion, followed by Customer Relations (3.22%), Food Service & Hospitality (2.94%), and others. The significant share of sales roles aligns with the demand for customer-facing positions, especially in retail and commerce industries. Departments like customer relations and food services highlight the importance of interpersonal and service skills in the job market. Lower shares for specialized departments like IT & Telecommunications or Merchandising suggest fewer open positions in these fields compared to general service-oriented roles.

Figure 5 shows the distribution of open job positions across various industries. The Retail & Commerce sector holds the largest share of open positions at 27.13%, reflecting its significance in Romania's job market. The Services sector contributes 19.40%, likely encompassing roles in customer support, IT services, and general business operations. Tourism & Hospitality accounts for 15.91%, emphasizing positions related to Romania's growing tourism economy, including roles in hotels, restaurants, and related fields. Transport, Logistics, Import/Export make up 14.59%, highlighting the importance of logistics and Romania's role as a regional hub for trade and transportation. The Food Industry represents 14.23% of the open positions, including roles in food production, supply chains, and related sectors. Call Center & BPO accounts for 9.69%, showcasing Romania's position in outsourcing, particularly in customer service and

back-office support. Manufacturing/Production contributes 7.71%, reflecting industrial activities such as production and assembly, while Construction holds 7.48%, indicating opportunities in infrastructure development, housing projects, and related fields. This breakdown underscores a strong focus on consumer-driven industries and urban economic activity, with Retail & Commerce leading the market.

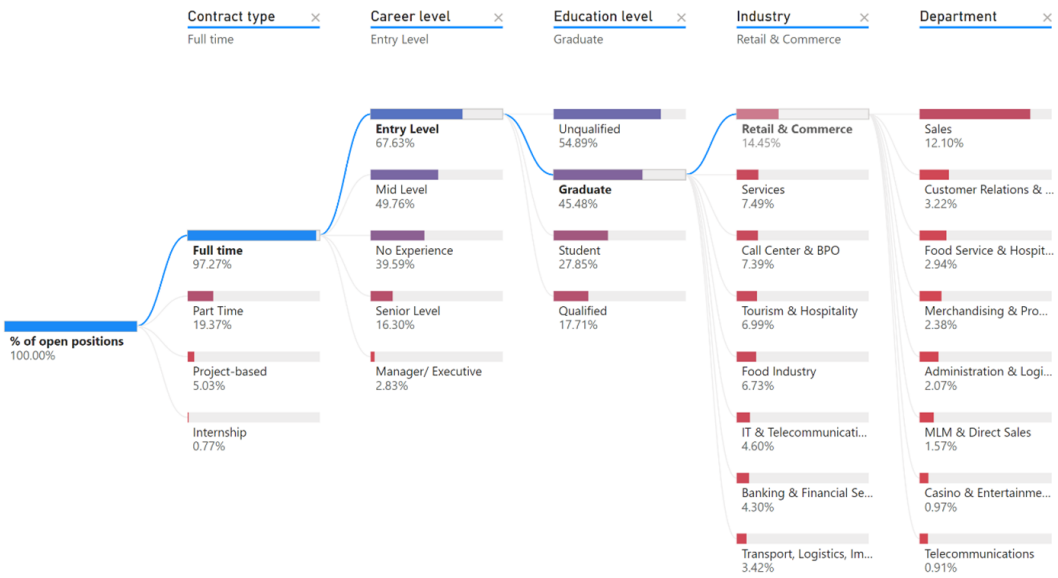

FIGURE 5. DISTRIBUTION OF OPEN JOB POSITIONS ACROSS CATEGORIES
Source: Authors' research

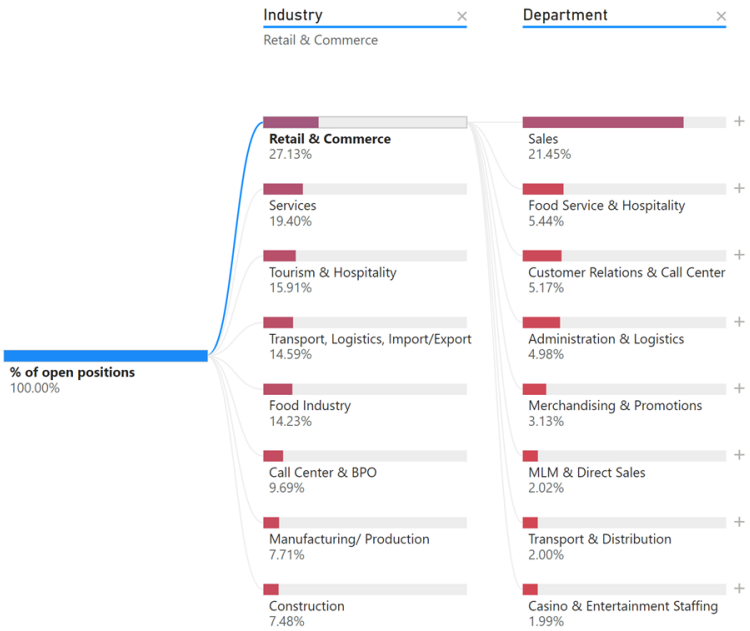

FIGURE 6. DISTRIBUTION OF OPEN POSITION ACROSS INDUSTRIES
Source: Authors' research

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Within each industry, open positions are further categorized by department. In Retail & Commerce, the top departments include Sales, which accounts for 21.45% of positions, reflecting a significant focus on customer-facing roles. Food Service & Hospitality follows with 5.44%, associated with retail and hospitality sectors. Customer Relations & Call Center represents 5.17%, tied to service-oriented industries, while Administration & Logistics accounts for 4.98%, emphasizing the operational backbone of these industries. Merchandising & Promotions contributes 3.13%, related to marketing and product management roles. Smaller proportions are seen in specialized areas such as MLM & Direct Sales with 2.02%, Transport & Distribution with 2.00%, and Casino & Entertainment Staffing with 1.99%.

5. CONCLUSIONS

The Romanian labor market analysis by using OJAs underlines some critical trends and challenges with regard to workforce availability and skill alignment. This reflects the results of global literature contributions on this topic, such as Giambona et al. (2024), Kahlawi et al. (2024), or Colombo et al. (2019), that OJAs are a valuable complement to traditional labor market data sources due to their potential for detailed, timely, and geographically nuanced insights. This study demonstrates that urban centers like Bucharest dominate job opportunities, aligning with established patterns of industrialization and foreign investment driving employment in metropolitan areas. Conversely, rural areas exhibit limited opportunities, mirroring global disparities in labor market dynamics.

The results indicate a strong need for full-time jobs, while part-time and project work is limited. These features are consistent with Romania's fiscal policy that created deterrents to part-time working through the application of social contributions at minimum wage levels. Requirements for education in available posts further reflect a mixed availability where most positions are available for people with no formal education. However, the strong percentage of graduate-level jobs shows the demand for higher education and technical and professional careers.

The sectoral analysis identifies Retail & Commerce as the most represented industry, driven by the urbanization of Romania and the consumerist orientation of the country's economy. To complement that, substantial roles in Services, Call Centers, and Hospitality point to Romania's economic growth and outsourcing capabilities. However, the prevalence of entry-level jobs and the low proportion of senior and managerial jobs hint at a focus on lower-cost labor with a possible gap in opportunities for experienced professionals.

This study confirms the results of Beręsewicz et al. (2024) and Acemoglu et al. (2020) that the mismatch between educational attainment and job market needs is continuous. To respond to these challenges, workforce development strategies should be targeted, especially in skills training, toward the needs of

industry. Tailored interventions in the form of vocational training and regional skill development programs are crucial for reducing disparities in the labor market and equipping the workforce with the requirements of the changing economy.

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