



## The IT Labor Market in the Western Balkans: Exploratory Evidence from Online Job Postings

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### Abstract

*The initial data collected for the year 2024-2025 included a total of 4036 job advertisements in the IT sector. After a detailed data cleaning process, the final sample for the descriptive analysis was reduced to 1609 valid advertisements. However, information on salary was limited, as only 104 advertisements contained accurate and usable data on annual compensation. In this context, descriptive analyses were conducted on the entire sample of 1609 advertisements, while for cases with salary information, an OLS regression model was applied to assess the relationship between salary level and factors such as required technologies, work style and role characteristics. Given the relatively limited number of salary observations, the analysis is conceived in an exploratory manner and does not aim to produce general statistical conclusions for the entire labor market. The overall results provide a picture of the regional IT sector market which mainly operates on the basis of a combination of technical skills, rather than on the basis of a formal work model.*

**Keywords:** IT Sector, Western Balkan, Web Crawling, Exploratory Analysis

### 1. Introduction

With the rapid development of the digital transformation of the global economy, the importance of the information technology (IT) sector and the demand for specialized professionals in this field have increased significantly. Rapid technological developments, the consequent spread of digital services and the growth of the knowledge-based economy have made IT skills among the most sought-after in the modern labor market, in a global context. In this regard, analyzing the labor market dynamics in the IT sector has become an important topic for researchers, policymakers and economic actors, as it provides valuable information on the demand for skills, the structure of professions and the development trends of this sector.

One of the most important sources for studying the transformations in the labor market in the digital age is the analysis of data generated by online job platforms. These advertisements published on online platforms provide valuable information on the current demand for professional skills and competencies, reflecting in real time changes in the structure of the labor market and the evolution of the digital economy. The authors argue that trends in the demand for technological skills, the geographical distribution of labor and the dynamics of employment in knowledge-based sectors are identified through data collected by recruitment platforms. However, they claim that this labor market sample is not complete, as it only includes activity published on online channels, and therefore the analyses based on them should be

interpreted mainly in an exploratory manner and as indicators of structural trends in the labor market.

The Western Balkan countries have experienced significant growth in the information technology sector over the past decade. This sector has become one of the most dynamic segments of the economies of these countries, offering various benefits by contributing to the creation of new jobs, increasing exports of services and the greater integration of local economies into international markets. IT companies in the region are increasingly involved in international projects, especially through the outsourcing model and the provision of software development services for global markets. As a result, the demand for qualified professionals in the IT field has also experienced significant growth in these countries, creating an increasingly competitive and dynamic labor market.

However, there is still a relative lack of empirical studies that systematically analyze the characteristics and structure of the labor market in this sector in the Western Balkan countries. In most studies conducted with traditional labor market statistics, we have relatively general information on employment and occupations and usually do not provide detailed information on the demand for specific technological skills, the technologies required by employers or the rapid changes that characterize the labor market in the IT sector. These shortcomings have led recent studies in the international literature to increasingly use alternative data sources, such as online job advertisements, to analyze in real time the demand for jobs and skills in the labor market.

## 2. Literature Review

Considering the field of outsourcing in general and then IT Outsourcing in particular, the scientific literature in many aspects considers outsourcing as one of the main factors contributing to economic development in the conditions of the contemporary capitalist economy. In this regard, this development is achieved by considering that outsourcing contributes to increasing efficiency, positively affects the allocation of resources and the integration of markets, contributing positively to economic development in general both at the national and international levels (Paudel, 2023).

Regarding IT Outsourcing, historically, it was mainly applied to secondary activities, considering that possible failures would not reflect the functioning of the company. Later, the need and importance of IT Outsourcing grew steadily, encompassing the most strategic activities of the company because it provides access to important and strategic information for the organization (Slonieć & Kaczorowska, 2019). Many studies have used different approaches to analyze the field of outsourcing, focusing mainly on the impact of customer capabilities on the success of IT outsourcing at the industry level or at the individual level. However, outsourcing of IT services is now considered essential for organizational strategy, and this makes IT outsourcing necessary to be analyzed from other perspectives as well as from the perspective of the enterprise as a whole. Therefore, the impact of IT outsourcing at the company level is essential to understand its impact on performance and long-term strategic development (Alaghehband & Rivard, 2020).

Online job postings are considered an increasingly important source for analyzing labor market dynamics, because the information they contain is directly related to companies' current demand for specific skills and competencies. To exploit this analytical potential, the data collection methods used by researchers are automated, such as web crawling and web scraping, which enable the systematic extraction of information from online job platforms. These methods allow the creation of large databases of job postings, which can then be analyzed to identify the most sought-after technologies, professional roles, and labor market characteristics over time (Tzimas, Zotos, Mourelatos, Giotopoulos, & Zervas, 2024).

As a result of frequent changes in job requirements, the use of automatic methods for classifying and analyzing job postings is increasingly necessary in these circumstances. Natural language processing techniques and machine learning algorithms can be used to identify required skills and categorize jobs based on the required professions and competencies (Boselli, Cesarini, Mercurio, & Mezzanatica, 2018).

Using techniques such as web crawling, web scraping and text mining, researchers can collect and analyze a large number of job postings to identify the skills, competencies and professional profiles most in demand in a given sector. This approach enables the creation of a more accurate representation of labor market requirements and helps in defining professional profiles that reflect the current needs of the industry. In this study, a labor market analysis was carried out in the field of medical informatics for job postings from an online job portal. The researchers analyzed the requirements of employers and identified the most frequent terms describing the required skills and competencies. The results showed that only about 45% of the requirements are related to technical expertise, while 55% are related to soft skills such as communication, teamwork and problem solving. The most frequently used terms were programming, experience, project and server, indicating the importance of combining technical skills and practical experience in the labor market for this sector (Schedlbauer, Raptis, & Ludwig, 2021).

A report by the OECD that analyzed the labor market based on millions of online job postings found a significant increase in digital professions in many developed countries. The results identified professions that have experienced the highest growth in job descriptions such as: software developers, programmers, engineers and data scientists. The analysis of job postings informed that these professions require a combination of technical skills and advanced cognitive skills, including database management, data analysis and programming knowledge. Furthermore, the demand for advanced analytical skills such as machine learning, data science and data visualization has increased significantly and is spreading across many different professions and sectors of the economy (OECD, 2022).

Similarly, a study based on the analysis of online job postings used data from recruitment portals to identify skills shortages in the labor market. Here, the demands for occupations and competencies in job postings were analyzed, where the authors used a method that can identify occupations where there is a gap between the demand of employers and the supply of labor. The results found that the analysis of job postings can be used to dynamically detect occupations where skill shortages appear and to monitor changes in the demand for specific competencies in the labor market. So, through this approach, data from online job postings can serve as an important source for the analysis of employment trends and for the identification of skill shortages in different sectors of the economy (Dawson, Rizoïu, & Johnsto, 2019). In a study conducted on the demand for skills and professions in the labor market, a very large number of job postings were collected on the professional platform LinkedIn. Through this process, the authors identified important patterns in the demand for technical and professional skills, showing that job postings contain valuable information about the structure of employer demand. The findings of this study indicate that digital and technological skills appear among the most sought-after competencies in job descriptions, while analyzing the text of the advertisements can be used to identify professional profiles and recruitment trends in the labor market (Jafari & Chitsaz, 2024).

Similarly, another study using web scraping techniques analyzed job listings, confirming that data collection from job portals helps analyze recruitment trends and demand for different professions in the labor market. Using Python and the Beautiful Soup library, the authors built a system that extracts structured information from job listings with the following variables: position title, company, location, and job description. The study emphasizes that automating the collection of data from job listings creates opportunities to analyze the labor market and generate insights on employment trends and demand for skills in different industries (Mishra, 2025).

The European Union agency for the development of vocational education and skills (Cedefop), has implemented a pan-European approach to collecting and analyzing online job postings as a tool to monitor labor market transformations. Analysis of these job postings in seven EU Member States has shown that job posting data can be used to draw conclusions about skills demand and employment trends in real time, providing a complementary dimension to traditional labor market analysis methods such as surveys or skills indices. This approach has been used to extract information on the skills most in demand by employers, as well as to contribute to skills intelligence and vocational education policies (Cedefop, 2019).

Similarly, in a study of online job postings, data collected from the Adzuna portal were used to measure skill demand in the labor market. The authors, through the application of natural language processing methods and statistical techniques, concluded that extracting information on skills from job descriptions can provide a detailed picture of aspects of demand by employers, including the relationship between the required skills and the proposed financial reward. Through this approach, an alternative way is offered to measure the demand for specific skills in real time, overcoming the limitations of traditional methods of measuring human capital and data based on traditional surveys (Vassilev, Romanko, & Evans, 2022).

Data analysis from online job postings offers the opportunity to empirically identify the demand for technological skills and professional competencies in different economic sectors. By analyzing job descriptions and candidate requirements, researchers can identify dominant technologies, changes in the structure of occupations, and trends in labor market development. The contribution of this approach lies in better understanding the link between technological development and the demand for certain skills, providing valuable information for policymakers, educational institutions, and companies operating in technology sectors (Tzimas, Zotos, Mourelatos, Giotopoulos, & Zervas, 2024).

The benefits of analyzing online job postings are related to the significant reduction in the time required to generate labor market information compared to traditional survey-based methods. Furthermore, the use of standard occupational classifications enables data analysis in multilingual and international contexts (Boselli, Cesarini, Mercorio, & Mezzanzanica, 2018).

Eurostat has developed experimental statistics on the labor market demand for ICT specialists by collecting data from online job advertisements through a web scraping process, which it has processed using the natural language processing method. According to their results, the digital transformation of the economy has significantly increased the

demand for ICT specialists and has changed the structure of the labor market. Their findings state that around 8.5% of online job advertisements in Europe are for ICT specialists. Also, almost 60% of ICT advertisements are for software developers and analysts (Eurostat, n.d).

Previous studies highlight the importance of data from online job advertisements based on providing information that is often not available in traditional labor market statistics, especially regarding the skills required by employers. The study also analyzes the demand for skills in Italy over the period 2019–2022, identifying changes in skill demand depending on economic sectors, regions and occupational groups. The article mentions that CEDEFOP and Eurostat have developed systems for collecting online job advertisements at European level to produce new statistics on labor and skills demand (Catanese, Inglese, & Lucarelli, 2023).

Despite the advantages of online job postings, this process is nevertheless accompanied by several methodological challenges, the most common of which are: the very large volume of data, unstructured text and irrelevant information, lack of data or incomplete data, and most importantly, the risk that the data is not fully representative of the entire labor market (Turulja, Vugec, & Pejić, 2023).

### 3. Methodology and Methods

To develop the financial analysis, an exploratory dataset was also built based on data obtained from online job advertisements in the IT sector for several Western Balkan countries, namely North Macedonia, Kosovo, Serbia and Albania from the hiring.cafe platform. The data was collected through a web crawling process, which focused on identifying the main elements of demand in the labor market, such as the technical skills required by employers, job descriptions and characteristics, the level of experience required, the way of organizing the work (remote work or on-site), as well as salary information when available in the advertisement. It is worth noting that these data do not constitute a complete probabilistic sample of the labor market, as they only include public job advertisements published on the Internet during the analyzed period, i.e. for the year 2024-2025. Consequently, a characteristic of this analysis is its exploratory character and aims primarily to identify the main trends and patterns in the demand for work in the IT sector. To analyze the collected data, exploratory OLS regression models were used, in which the dependent variable is the logarithm of the salary published in job advertisements, while the independent variables include the technical skills or specific technologies required, the level of professional experience, the way work is organized (remote work or on-site), as well as variables related to geographical location.

Initially, the raw data included 4036 job advertisements in the IT sector, while after the data cleaning process the final sample for descriptive analyses was reduced to 1609 valid advertisements, where valid salary data provided only 104 job advertisements. As a result, descriptive analyses were performed on 1609 advertisements, while econometric analysis (OLS regression) was applied to 104 complete salary cases.

### 4. Results

From the explanatory analysis, the following results provide information on the labor market in the IT sector for the Western Balkans region.

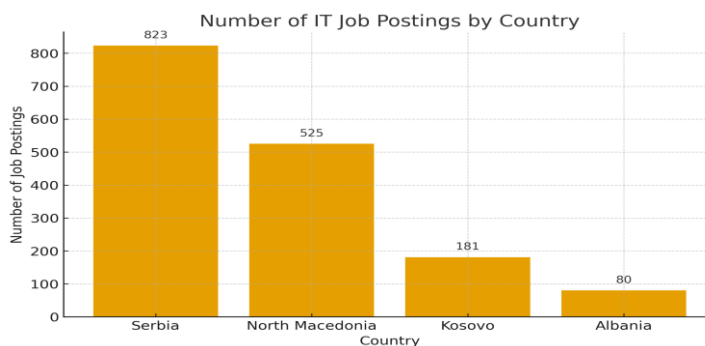
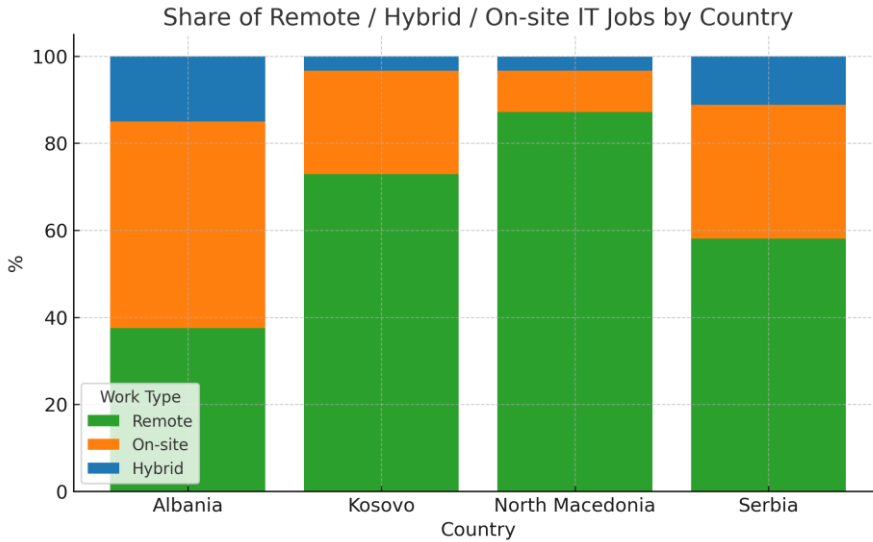


Figure 1. Number of IT Job Postings

**Source:** Generated with Python (matplotlib & seaborn)

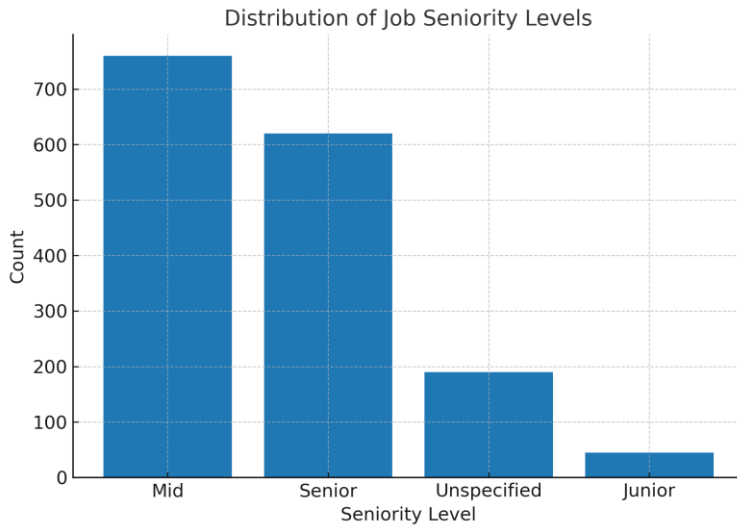
This graph presents the distribution of job postings in the IT sector by country, including Serbia, North Macedonia, Kosovo and Albania. As can be seen, Serbia occupies the largest share of the market with around 823 job postings, followed by North Macedonia with 525, Kosovo with 181 and Albania with 80. These data show a high concentration of the IT Outsourcing market in Serbia and North Macedonia, which can be explained by the earlier development of the technological ecosystem, the presence of international service centers and foreign direct investment in these two countries. While Kosovo and Albania, although having a lower presence, are showing an increasing trend in the demand for IT professionals.



**Figure 2:** Distribution of remote, on-site and hybrid IT job postings

**Source:** Generated with Python (matplotlib & seaborn)

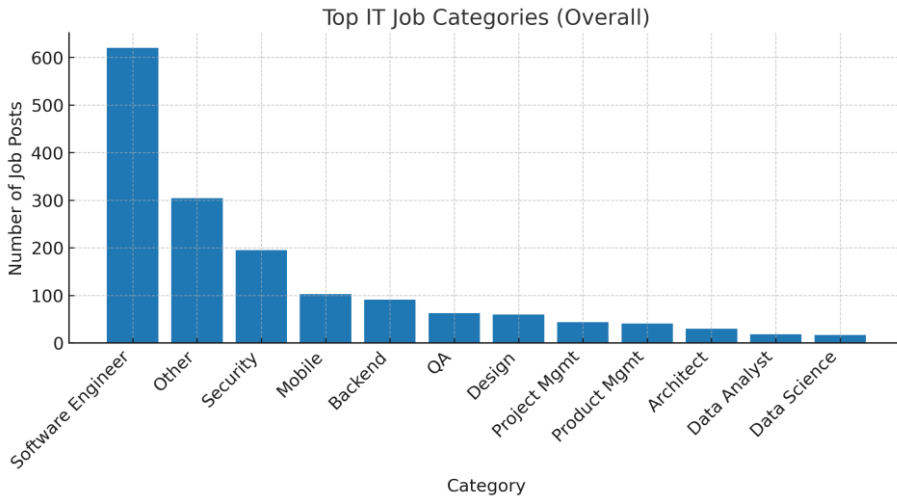
North Macedonia leads with the highest percentage of remote jobs (87.2%), reflecting a wide adoption of flexible work models in outsourcing companies. Kosovo also presents a strong dominance of 'Remote' jobs (72.9%), which is related to the orientation of its market towards international collaborations. Serbia and Albania have a more balanced distribution between remote, 'On-site' and 'Hybrid' jobs, which suggests more traditional market structures and more linked to physical presence. This result points to differences in the level of digitalization and flexibility of labor markets in the Balkan region. These percentages are presented in tabular form in the table below.



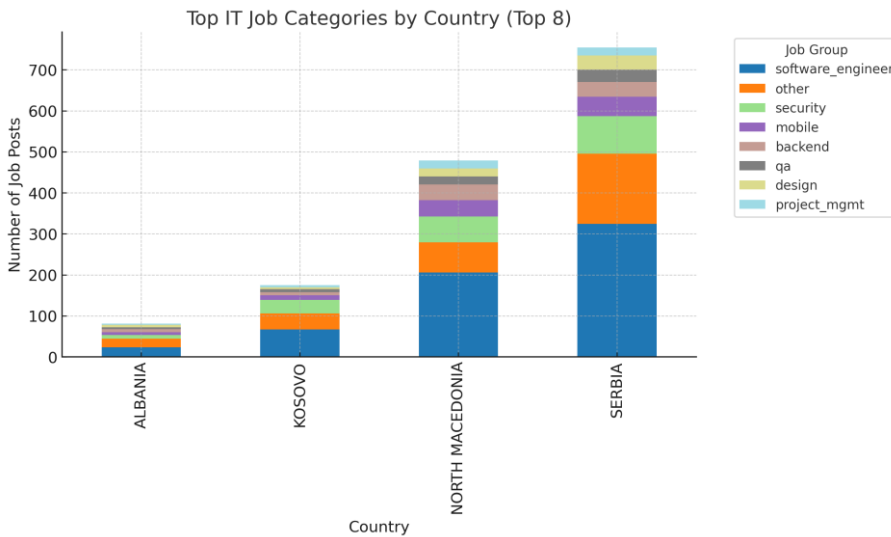
**Figure 3.** Distribution of Job Seniority Levels  
**Source:** Generated with Python (matplotlib & seaborn).

The dominance of the 'mid' and 'senior' categories indicates that the regional labor market is more oriented towards experienced professionals, who are able to contribute immediately to complex projects and outsourcing services. The lower participation of 'junior' positions suggests a limited capacity for integrating new talent or a preference of companies for employees who require less training and have more immediate productivity. The 'unspecified' category indicates that some of the advertisements do not clearly define the seniority level, which may be related to more flexible recruitment practices in small companies or start-ups. These data reflect a labor market that requires high technical quality and experience, highlighting high competition in mid- and senior-level positions.

The following graph shows the most in-demand job categories in the IT sector in the analyzed region. The dominant category is that of 'Software Engineer', which shows that software development remains the main pillar of the IT Outsourcing industry in the Balkans. This reflects the high demand for programmers with knowledge in various programming languages and the ability to build customized technological solutions for international markets. The 'Security' category ranks among the most important, reflecting the increased sensitivity to cybersecurity, while 'Mobile' and 'Backend' represent the areas that support the development of modern applications. The presence of roles such as 'QA', 'Design' and 'Project Management' suggests an increasingly complete ecosystem, where combined technical and managerial skills are required. This result indicates the maturation of the IT job market, with clear demands for advanced specializations and diversification of professional roles. Below is a table with the exact numbers of the most sought-after job categories in the IT sector in the region.



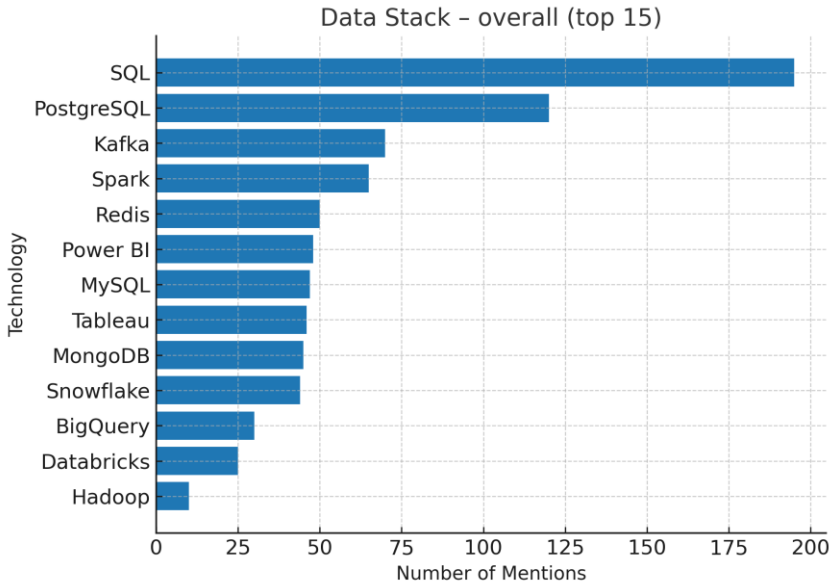
**Figure 4.** Overall Top IT Job Categories  
 Source: Generated with Python (matplotlib & seaborn).



**Figure 5.** Top 8 IT Job Categories by Country  
 Source: Generated with Python (matplotlib & seaborn).

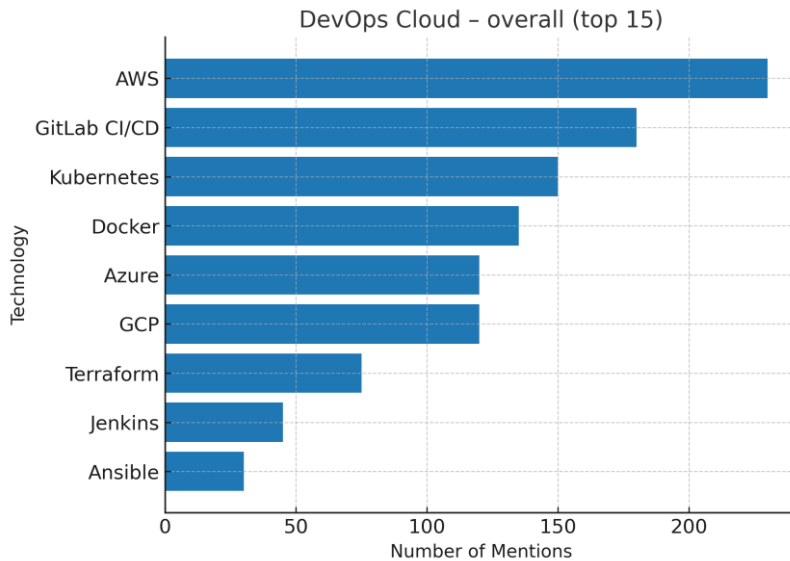
Serbia and North Macedonia lead in the total number of advertisements, reflecting the higher development of the IT Outsourcing sector and the presence of international companies seeking local expertise. In both countries, the most sought-after positions are 'Software Engineer' and 'Security', which indicates a focus on application development and cyber protection. While in Kosovo and Albania, the market structure is smaller, but follows the same trend with the dominance of software development positions. This result highlights the increasing demand for technical roles, as well as the gradual inclusion of positions such as 'Project Management' and 'Design', which indicate the maturity of the market towards the full IT services production chain. Finally, the data suggests that the region is developing towards a balance

between technical and managerial roles, strengthening competition in the regional outsourcing market.



**Figure 6.** Top 15 Data Stack  
**Source:** Generated with Python (matplotlib & seaborn).

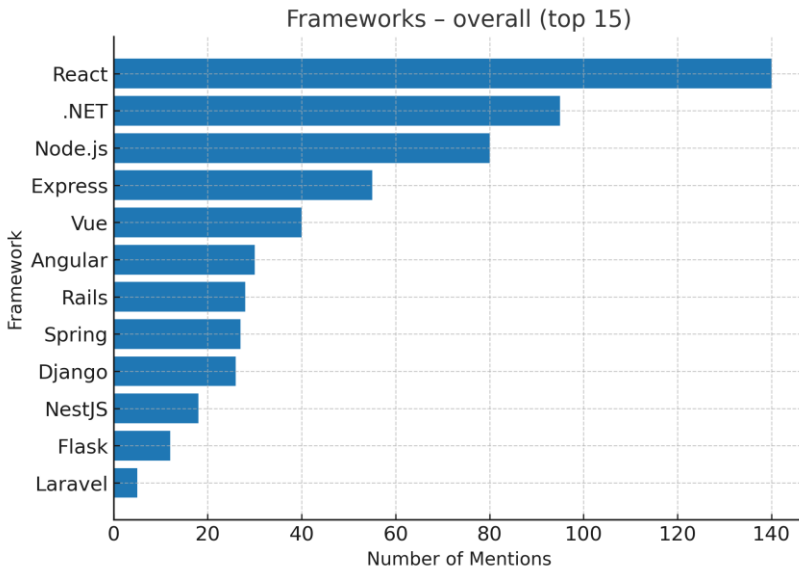
As can be seen, SQL remains the most dominant component in the entire data-related job ecosystem, appearing in almost every job description. This fact underscores the continued importance of relational databases and the ability to manipulate data in a structured manner. After SQL, technologies such as PostgreSQL, Kafka, and Spark show the orientation towards real-time data management and parallel processing. The presence of tools such as Power BI and Tableau suggests a high demand for skills in data visualization and analysis, while modern technologies such as Snowflake, Databricks, and BigQuery show the adoption of cloud platforms for advanced analytics. Overall, the results show that the regional market is moving towards a balance between traditional and modern cloud-based technologies, which reflects the increasing complexity of the requirements for roles related to Data Engineering and Business Intelligence.



**Figure 7.** Top 15 DevOps Cloud

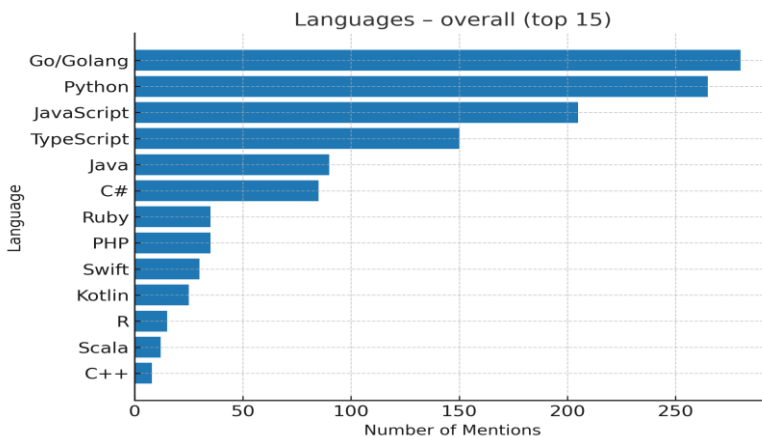
**Source:** Generated with Python (matplotlib & seaborn).

At the top of the list is AWS, which demonstrates the dominant role of Amazon Web Services in cloud infrastructure at a global and regional level. Immediately following it is GitLab CI/CD, which shows the importance of automating continuous integration and delivery processes in modern software development. Kubernetes and Docker are also essential, reflecting the market orientation towards container orchestration and standardization of development environments. Azure and GCP remain the main options for companies using multi-cloud platforms, while Terraform, Jenkins and Ansible show the adoption of tools for infrastructure automation and configuration management. In summary, the data highlights the consolidation of cloud-native technologies and automation as key components of modern DevOps architecture, reinforcing the demand for expertise in this area.



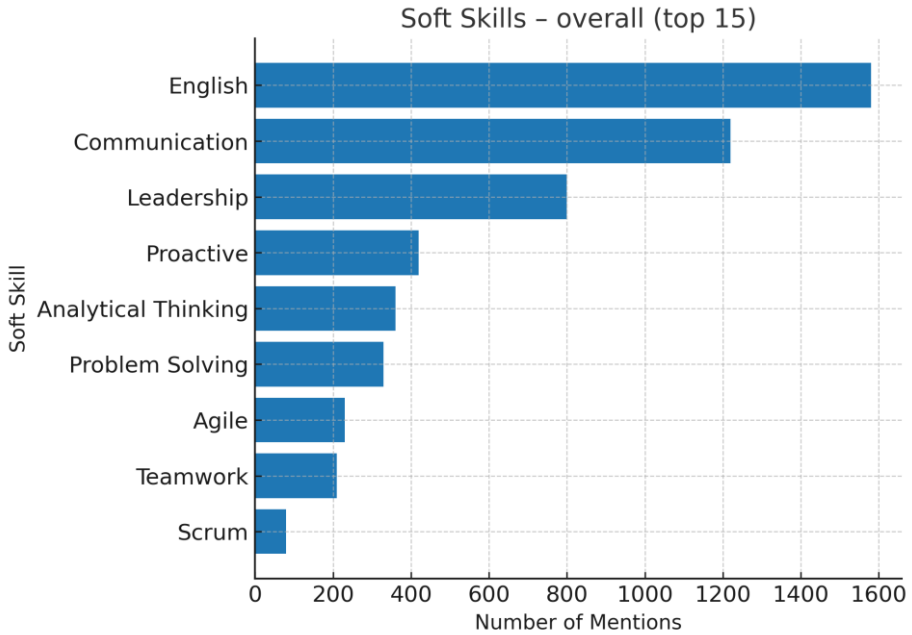
**Figure 8.** Top 15 Frameworks  
**Source:** Generated with Python (matplotlib & seaborn).

The results show that React clearly dominates the market, reflecting its widespread popularity in front-end application development and the dynamic ecosystem it offers for interactive interfaces. .NET and Node.js follow closely, highlighting the high demand for full-stack developers and the ability to build stable applications in different environments. Frameworks such as Express, Vue and Angular complete this picture with the flexibility they offer for developing modern web applications. On the other hand, frameworks such as Django, Spring and Rails maintain their importance in back-end and enterprise application development. In summary, the data shows that the demand in the job market is mainly focused on the JavaScript and .NET ecosystems, underlining the trend towards cloud-native and cross-platform application development.



**Figure 9.** Top 15 Languages  
**Source:** Generated with Python (matplotlib & seaborn).

The dominance of Go/Golang and Python suggests a strong focus on cloud-native infrastructure, micro services and scalable systems development (Go), as well as data analytics, automation and rapid application development (Python). JavaScript and TypeScript remain the backbone of modern front-end/back-end web development and applications. Java and C# hold a steady presence in enterprise environments, while languages like Ruby/PHP have a more limited but steady presence in legacy systems. The presence of languages like Swift/Kotlin reflects the demand for mobile development, while R/Scala shows niches in data science and JVM ecosystems. Overall, the results reinforce two trends: (1) the consolidation of the JavaScript/TypeScript ecosystem for application development and (2) the increasing demand for Go and Python as the main languages for cloud, micro services and analytics.



**Figure 10.** Top 15 Soft Skills

**Source:** Generated with Python (matplotlib & seaborn).

Communication skills and English proficiency are the most dominant elements, reflecting the global demand for international collaboration and flexibility in distributed teams. Leadership and proactivity indicate the industry's orientation towards self-management and taking initiative, especially in agile work environments. Analytical thinking and problem-solving are essential for positions that require critical thinking and a strategic approach. The presence of terms such as 'Agile', 'Teamwork' and 'Scrum' underlines that collaboration and modern development methodologies are widespread standards in the work culture of technology companies. Overall, the results show that, in addition to technical skills, IT companies highly value interpersonal competencies that guarantee efficiency, effective communication and adaptation to change.

Results from regression using log (salary\_year\_eur) as target. Standard errors: stable HC3.

**Table 1.** OLS Regression Results

OLS Regression Results			
Dep. Variable:	<u>log_salary</u>	R-squared:	0.287
Model:	OLS	Adj. R-squared:	0.193
Method:	Least Squares	F-statistic:	6.405
Date:	Thu, 06 Nov 2025	Prob (F-statistic):	4.09e-08
Time:	14:49:32	Log-Likelihood:	-187.12
No. Observations:	104	AIC:	400.2
<u>Df</u> Residuals:	91	BIC:	434.6
<u>Df</u> Model:	12		
Covariance Type:	HC3		

Ordinary Least Squares (OLS) with robust HC3 standard errors was used to correct for possible heteroskedasticity. In this regression model, the dependent variable is the logarithm of annual salary (log\_salary), while the explanatory variables include location, seniority level, work style, programming languages, and soft skills.

The regression results with a value of  $R^2 = 0.287$  indicate that approximately 28.7% of the variation in annual salaries is explained by the variables included in the model. After adjusting for the number of predictors, the model explains 19.3% of the variation in salaries. The F-statistics indicate that the model as a whole is statistically significant, meaning that at least one predictor has a non-zero effect on salaries.

**Table 2.** Regression Results for IT Job Characteristics

	<u>coef</u>	std err	z	P> z	[0.025	0.975]
Intercept	10.7071	1.327	8.068	0.000	8.106	13.308
C( <u>country_guess</u> )[T.KOSOVO]	-1.5024	0.955	-1.573	0.116	-3.374	0.369
C( <u>country_guess</u> )[T.NORTH MACEDONIA]	-1.6758	0.768	-2.183	0.029	-3.180	-0.171
C( <u>country_guess</u> )[T.SERBIA]	-1.5572	0.651	-2.392	0.017	-2.833	-0.281
C( <u>seniority</u> )[T.mid]	-0.1184	0.787	-0.150	0.880	-1.660	1.424
C( <u>seniority</u> )[T.senior]	0.7484	0.840	0.890	0.373	-0.899	2.396
C( <u>seniority</u> )[T.unspecified]	1.2450	0.934	1.333	0.183	-0.586	3.076
C( <u>is_remote</u> )[T.On-site]	-1.3731	0.967	-1.420	0.155	-3.268	0.522
C( <u>is_remote</u> )[T.Remote]	-0.8434	0.926	-0.911	0.362	-2.658	0.971
<u>lang_php</u>	1.7777	0.831	2.140	0.032	0.150	3.406
<u>lang_swift</u>	-1.8144	0.503	-3.608	0.000	-2.800	-0.829
<u>lang_react</u>	0.8832	0.542	1.629	0.103	-0.180	1.946
<u>soft_analytical</u>	-0.1367	0.361	-0.378	0.705	-0.845	0.572
Omnibus:	6.982	Durbin-Watson:	1.052			
Prob(Omnibus):	0.030	Jarque-Bera (JB):	5.925			
Skew:	0.494	Prob(JB):	0.0517			
Kurtosis:	2.374	Cond. No.	35.5			

The exploratory model containing the data collected from online job advertisements shows a satisfactory level of statistical stability. The Durbin-Watson test ( $\approx 1.05$ ) does not signal the presence of significant autocorrelation in the model residuals, while the Jarque-Bera test (value  $\approx 5.9$ ,  $p \approx 0.05$ ) suggests an acceptable distribution of the residuals around normality. This implies that the basic assumptions of the OLS model have been respected within the technical framework. However, this does not necessarily imply empirical validity or representation of market reality, because we are dealing with an exploratory analysis.

For categorical variables, such as “country\_guess”, the model includes (k-1) binary variables to avoid perfect multicollinearity. Therefore, automatically as a result of alphabetical sorting, Albania is taken as the reference category. Consequently, the estimated coefficients of other countries are not interpreted as real absolute comparisons of salaries, but they are interpreted only in relation to Albania.

The existence of regional differences is generated by the results of the model regarding the IT Outsourcing market, where it is seen that North Macedonia and Serbia appear with lower average salary levels compared to Albania, which

should not be considered as real evidence, because these findings may be the result of some methodological limitations such as the small number of observations, crawling only collects active offers at a given moment which may be dominated by smaller companies, companies with non-transparent advertising policies where the salary does not reflect the real level of the final salary.

Similarly, some results deviate from the real knowledge possessed in the market, where for example the most paid technologies in practice such as PHP do not result in higher effects in the model. These deviations may depend on the sample structure, where the advertisements may come mainly from small companies or on the way in which companies report salaries in online advertisements.

The results also show that seniority does not appear to be a statistically significant determinant of salary. Caution should be exercised in interpreting this result because the terms “junior”, “mid” and “senior” are not always used in a standardized manner. In most cases, these terms are related to years of experience, or technical skills or even role responsibilities.

Regarding the variables related to the way of working (remote or on-site), the results show that they are not statistically significant. This result signals the fact that the regional IT market is hybridized, where the salary is not determined by the location or the way of working, but by the skill profile.

Based on these results, the exploratory model reflects the volatility of skill demand in the regional IT market, rather than being an accurate measure of real wage levels or labor market structure. This analysis serves to further discuss the sustainability of the sector and to link labor market dynamics to the financial performance of IT companies, analyzed in previous chapters.

The results of the exploratory analysis suggest that technical skills are more informative than other variables in the structure of job postings; however, the interpretation of these findings is exploratory and indicative and should not be considered definitive.

The positive result for PHP is likely related to the composition of the sample and the nature of the advertisements collected, which may include specific roles or companies with different transparency policies in reporting salaries. Similarly, the negative effect for Swift should not be understood as a real underestimation of iOS positions, but rather as a consequence of the small number of advertisements and a very heterogeneous sample. The positive result for React indicates that the demand for front-end skills is increasing but there is a reservation in interpretation as the statistical significance is borderline. The negative result for analytical skills may be the result of the misuse of the term which is often used generically in job advertisements and is not used specifically for any skill.

Finally, these results represent an exploratory and indicative analysis of the structure of demand for IT skills, and do not accurately reflect the reality of the labor market, as they are affected by the limited number of data.

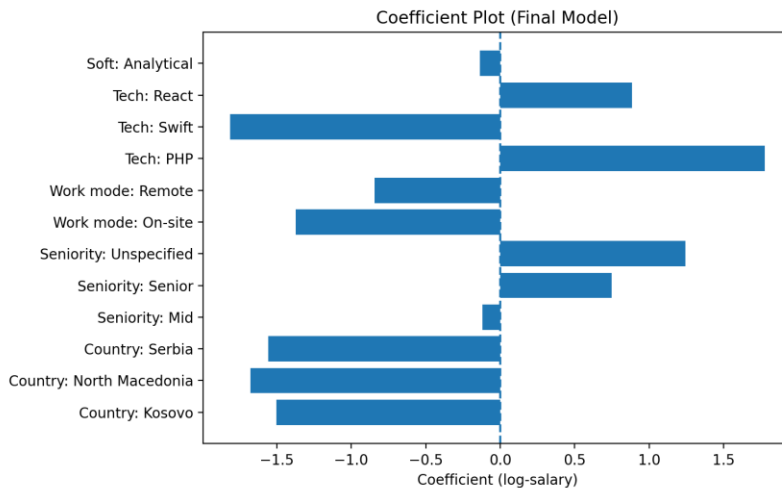


Figure 11. Coefficient Plot Results

Given that the analysis is based on a limited number of observations and on data collected at a specific point in time, these results are indicative and not reflective of the reality of the market. The positive coefficients for PHP and React suggest that these technologies are associated with higher levels of salaries reported in advertisements, however, these effects may be influenced by the sample structure and the representation of specific companies. Similarly, the negative effect of Swift, resulting from the small number of observations and the heterogeneity of advertisements, should not be considered as a real underestimation of the situation.

The lack of consistent effects for seniority and work style indicates that the level of pay is not determined by these categories, which may be a result of the fact that these terms are usually used in a non-standardized manner. Overall, the figure reflects a fragmented and technical skills-driven structure of the regional IT outsourcing market, considering it as a guiding basis for further discussion on the analysis of the sustainability of the sector.

## 5. Discussion

The results from the exploratory analysis are consistent with other research arguments in the existing literature, where technical skills are the most informative and influential factors influencing the labor market, where the literature on the impact of artificial intelligence supports the fact that advanced technologies increase the demand for specific technical skills and weaken the importance of formal seniority or work style (remote or on-site).

However, the differences in the location context on salaries advertised online, or the not very strong impact of some technologies that in real practice should not be so, reflect the fact of the lack of available data. This is consistent with the methodological literature that establishes that these limited data have temporal implications that are affected by several components such as the moment of data collection, the transparency of companies in announcing salaries, the standardization of some specific terms and the sample structure. Therefore, there is no contradiction from the perspective of the literature, but an increased caution is noted in the interpretation of the data and results.

## 6. Limitations

The collected data do not constitute a complete probabilistic sample of the labor market, as they only include public job advertisements published online during the analyzed period, i.e. for the year 2024-2025. Therefore, the econometric analysis of wages was conducted on a subsample of 104 observations with valid wage data, because salary information is not always available in online job advertisements. This may limit the statistical power of the analysis and may affect the ability to draw more general conclusions about the wage structure in the IT sector.

## 7. Conclusion

The process of web crawling for online job postings in the countries included in the study yielded results that are considered supplementary evidence and do not constitute a direct interpretation of the real level of salaries. These results provide an indicative basis on a volatile market in which the demand for certain technologies varies depending on the projects, technologies and regional context.

Regarding the most sought-after technical skills or technologies, the results provide findings that these skills are more informative than other categories such as seniority level and working mode such as remote and on-site work. The results suggest that the regional IT sector market operates mainly on the basis of a combination of technical skills, and not on the basis of a formal work model.

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