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Comparative Analysis of Skill Shortages, Skill Mismatches, and the Threats of Migration in Labor Markets: A Sectoral Approach in North Macedonia, Türkiye, Ethiopia, and Ukraine

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Abstract: Labor markets worldwide are increasingly strained by skill shortages, mismatches, and migration pressures, disrupting workforce stability and economic growth. This study conducts a comparative sectoral analysis in North Macedonia, Türkiye, Ethiopia, and Ukraine, focusing on the manufacturing, information and communication technology, and hospitality sectors, to examine the root causes and economic consequences of these challenges. Using a qualitatively driven mixed-methods approach, the research integrates expert interviews, surveys, and labor market data to assess skill gaps, workforce imbalances, and the role of migration. The findings reveal education–industry misalignment, inadequate vocational training, and low wages as persistent drivers of shortages. Additionally, the war in Ukraine, internal conflicts in Ethiopia, and refugee inflows in Türkiye amplify workforce instability, while North Macedonia faces severe emigration, particularly in the sectors of manufacturing and information and communication technologies. These insights are essential for policymakers, industry leaders, and educators in designing labor market interventions that foster workforce resilience. The study recommends national qualification reforms, industry–education collaboration, and improved wage structures to mitigate talent loss and strengthen labor market sustainability. By offering empirical evidence from diverse socio-economic contexts, this research contributes to global discussions on workforce development, migration economics, and labor policy reforms.

Keywords: skill shortage; skill mismatch; labor migration; sectoral analysis; talent retention

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1. Introduction

Skill shortages and skill mismatches, accompanied by the potential economic threats from rising global migration, are some of the most complex and protruding issues in contemporary labor markets worldwide. These inter-related factors can rarely be observed independently. As Aluttis et al. (2014) point out, one of the key factors contributing to

skill shortages and mismatches is globalization and the subsequent migration of skilled individuals from low- to high-income countries, which disrupts workforce distribution. Additionally, skill mismatches arise from a disconnect between the skills possessed by workers and those demanded by employers (Cappelli 2015), influenced by labor market characteristics that prioritize job-specific skills over general educational attainment (Desjardins and Rubenson 2011). Furthermore, the asymmetric global distribution of talent and varying national policies regarding skilled migration complicate the ability of countries to effectively utilize their human resources, leading to persistent skill gaps (Kerr et al. 2016). However, historical experience indicates that economies with rigid labor markets struggle more with unemployment and skill mismatches, thus highlighting the need for more flexible systems that can adapt to the continuously changing labor demands (Schioppa 1991). As there is an increased emphasis on the importance of workforce adaptability and lifelong learning (Tikkanen 2014; Lim et al. 2024; Radovan 2024), it is crucial to understand how such skill shortages and mismatches occur. This should, in turn, help in formulating efficient, sustainable, and inclusive labor market policies, especially in economies that struggle with these considerable challenges (Cedefop 2023; ILO 2021).

Against the global backdrop, this study examines how these labor market phenomena occur in four very distinct country contexts, namely in North Macedonia, Türkiye, Ukraine, and Ethiopia. Their selection was justified based on the variability in their individual socioeconomic, geographic, and migration contexts. North Macedonia, Ukraine, Türkiye, and Ethiopia exhibit diverse economic structures and migration dynamics, making them critical case studies for examining the interplay of skill shortages, mismatches, and labor migration. As countries of origin for substantial migrant populations, North Macedonia and Türkiye face labor market pressures rooted in high unemployment, low wages, and even regional disparities, while Ukraine and Ethiopia struggle with economic instability and conflict (martial law)-driven workforce outflows, exacerbating the challenges of sustaining skilled labor and fostering inclusive economic growth. Consequently, this research offers unique insight into how skill shortages and mismatches influence, and are influenced by, migration patterns. While sector-specific factors can often be overlooked, this paper highlights the importance of such an approach, as it has been noted as being key to mapping labor market needs and educational outputs, as well as workforce mobility (McGuinness et al. 2017; World Bank 2021a).

Despite the global growth of the literature on this topic, much existing research has focused on developed countries, leaving gaps in our understanding of how skill shortages, mismatches, and threats of migration are manifested in countries such as North Macedonia, Türkiye, Ukraine, and Ethiopia. To fill this gap, the study was designed to be qualitative and comparative. A combination of primary and secondary data was used to study the problem at hand. Statistical data for the last decade were obtained from national and international databases to understand the skill shortages and mismatches of each country's individual labor market, as well as their domestic education and emigration. The findings are supported by a qualitative content analysis of primary data obtained through standardized, open-ended question-based interviews with key stakeholders, i.e., companies, higher education institutions (HEIs) and vocational education and training (VET) institutions, policy creators in the domain of education and the labor market, labor market intermediaries, and social partners. This approach was conducted with at least 40 participants from each country.

The aims of this study are threefold. First, we systematically assess the prevalence and characteristics of skill shortages across the manufacturing, information and communication technology (ICT), and hospitality sectors in the four countries, providing significant novelty to the global academic nexus. Second, the paper aims to analyze the extent to

which migration (namely emigration) shapes labor market imbalances. Third, the study provides targeted policy recommendations based on strengthening qualification frameworks, enhancing industry–education collaboration, addressing wage and labor standards to retain local talent, and leveraging migration to mitigate the adverse effects of these labor market phenomena. The study was designed to provide insights and findings in relation to three predominant research questions: (1) What are the sector-specific skill shortages and mismatches in the four countries? (2) How do different forms of migration increase or decrease those shortages and mismatches? (3) Which policy instruments hold the greatest promise for closing the widening labor market gaps emerging through inadequate education and pronounced migration?

The findings point out significant skill mismatches, labor shortages, and migration challenges in the four countries. North Macedonia struggles with emigration and a misalignment between education and labor market needs, and would benefit from modernized curricula, public–private collaboration, and return migration incentives. Ukraine, amid war and economic instability, shows emerging positive trends in workforce adaptation, emphasizing the need for it to align its qualification framework with European Union (EU) standards and improve adult education. In Türkiye, skill mismatches, brain drain, and inadequate on-the-job training require sustainable VET models and better integration of education with sector demands. Ethiopia witnesses skill shortages at higher levels, with graduates lacking the requisite competencies to take over the jobs that the labor market provides. Conversely, local markets also fail to provide decent jobs that could retain skilled workers.

This paper is structured as follows. Section 2 elaborates on the conceptual theoretical framework of the conducted study by focusing on shortages, mismatches, threats of migration, and the theoretical and empirical findings of related studies. In Section 3, we provide a detailed overview of the methodology employed. We present the data sources and the comparative design of the study, as well as the usage of case-specific methods for Ukraine. In Section 4, we conduct a sectoral approach, whereby the manufacturing, ICT, and hospitality sectors are investigated in detail. Section 5 is reserved for cross-country comparative analysis and policy recommendations, respectively. The paper discusses investments in skill development, migrant skill recognition, and sector-specific initiatives. Finally, Section 6 concludes the research by summarizing the findings and outlining the future research agenda, emphasizing the need for continued study at the intersection of skill development and migration in order to foster more resilient and equitable labor markets.

2. Literature Review

2.1. Skill Shortage

Skill shortages arise when the demand for skills within the labor market exceeds the available supply of workers who possess those skills. This can be a consequence of several factors, including rapid technological advancements, evolving industry needs, and demographic shifts (OECD 2023). The concept of skill shortages is inherently dynamic, as highlighted by the European Training Foundation (2017), emphasizing that these shortages are not static, but change with economic and technological developments. A key aspect of skill shortages is their link to wage dynamics. As Duszczyk and Kaczmarczyk (2022) find in their study on migration from Ukraine to Poland, when labor markets face shortages in specific skill sets, it often results in upward pressure on wages for those skills, as also suggested by the findings of the State Employment Service (2024) on registered labor demand in Ukraine. A similar case has been confirmed for German establishments, as per Kölling (2022). This dynamic can be further complicated by global trends such as migration, where the movement of skilled labor across borders can either alleviate or exacerbate

shortages in both origin and destination countries (European Training Foundation 2021). For example, Gulek (2024) provides an example of this occurring in the Türkiye labor market after it accepted refugees in the last decade, suggesting that this slowed down salary increases at the time. Understanding the nature and implications of skill shortages is essential in order for policymakers to devise effective strategies for education, training, and labor market interventions. The European Commission (2024) similarly suggested, in its report about Türkiye, that the effects of such dynamics and other aspects related to the labor market must also be considered and inspected regularly to be able to develop policies further.

2.2. Skill Mismatch

Skill mismatches, which can be either vertical or horizontal, occur when there is a discrepancy between the skills possessed by individuals and those required by the jobs available on the market. Vertical mismatch occurs when workers are either overeducated or undereducated for their jobs, while horizontal mismatch occurs when the type of education or skills do not align with job requirements, even if the education level is appropriate (Ege and Erdil 2023). This phenomenon is present in all four corners of the world. It is more visible and less easy to eliminate in developing countries; for example, a study conducted by the Ministry of Commerce (2024) indicates that despite the measures taken in previous years, the negative effects of skill mismatches are still highly visible in Türkiye. However, skill mismatches also affect developed countries like the European Union (EU) and its member states. The recent publication "Commission Staff Working Document for Ukraine" (The European Commission 2024) indicates the need to address this phenomenon as well. As indicated in the North Macedonian report published by the European Training Foundation, one of the main issues leading to these high levels of mismatch is pressure stemming from structural unemployment and poverty (European Training Foundation 2017). As in the case of North Macedonia, a significant share of Türkiye's workforce is in informal employment (OECD 2023), which exacerbates this mismatch. The high presence of informality prevents efficient adjustments and policies for formal employment. Thus, informality is considered one of the major causes of skill mismatches (European Union 2024).

This phenomenon is not limited to developing economies; it is a global issue that affects labor markets worldwide (ILO 2023). The consequences of skill mismatches are far-reaching, impacting not only individual career prospects and job satisfaction, but also firm productivity and overall economic growth (Mojsoska-Blazevski 2017). Research indicates that skill mismatches can lead to inefficiencies in the labor market, reduced job satisfaction, and increased turnover rates as individuals seek positions that better match their skills and qualifications. A study conducted by Onozuka (2022) highlights that mismatches tend to produce wage heterogeneities, with workers in jobs that are unrelated to their major field of study earning significantly lower wages than those in field-related jobs. Moreover, skill mismatch can impede innovation and the adoption of new technologies (The European Commission 2024), highlighting the critical need for educational and training systems to be responsive to the evolving demands of the labor market.

2.3. Threats of Migration

Migration, particularly the emigration of skilled workers, presents a complex set of challenges and opportunities for both the origin and destination countries. The movement of skilled workers, often referred to as "brain drain", can lead to significant skill shortages in the home country (DİSK 2019), affecting various sectors, including healthcare, education, and technology. This emigration is driven by a multitude of factors, such as higher wages, better living conditions, and more advanced professional opportunities abroad

(Türkstat 2024). Conversely, destination countries often benefit from an influx of skilled labor, which can contribute to economic growth and innovation. However, this can also lead to increased competition for jobs and potentially depress wages for native-born workers with similar skill levels. Additionally, migration can influence demographic changes, social integration, and cultural diversity in both origin and destination countries. For example, the huge influx of war refugees into Poland has led to significant demographic shifts, which must be considered when making long-term plans (Duszczyk and Kaczmarczyk 2022). The challenge of managing immigration from different origins to preserve social integrity while helping those in need highlights the importance of this discussion (Pham et al. 2023). As a final remark on the issue of threats of migration, there are other examples of how certain migration agreements can fail due to economic or social reasons, such as that observed in the case of the short-term effects of Syrian refugees on the Türkiye labor market, and how an influx of migrants can influence these factors (Gulek 2024).

Even though the comparative design of our study is founded on four countries that are considered origins of migration, several distinct characteristics are notable that contribute towards a greater risk of human capital depletion. For instance, even though North Macedonia has struggled with emigration historically, this trend has increased since 2018, affecting nearly all levels of educational attainment. Notably, brain drain remains a critical issue for North Macedonia. It is estimated that annually 2500 highly educated individuals emigrated from the country between 2013 and 2021, for which the country invested approximately 5 billion MKD (81.3 million EUR) on average every year (State Audit Office of the Republic of North Macedonia 2024). Moreover, the cost of brain drain of highly educated personnel from North Macedonia is estimated at 0.8% of GDP annually, and the loss of GDP due to emigration is estimated to be between 5.15% and 8.34% of the nominal GDP each year.

On the other hand, Türkiye can be considered both a country of origin and a country of destination for labor migration. Currently, Türkiye is reported to host 3,9 million migrants and refugees, 90% of whom are Syrians, who are subject to temporary protection regulations (IOM Türkiye 2025). There has also been an increase in the rate of migration from Türkiye. According to TURKSTAT (2023), the number of people migrating from Türkiye in 2023 increased by 53% compared to the previous year, and reached 714,579. Most of those who migrate abroad from Türkiye are qualified laborers, which leads to brain drain and employment gaps.

In Ukraine, the context is rather different. The war has had a significant impact on the processes of labor migration, both within the country and beyond. Between 2022 and 2024, the number of Ukrainians who moved abroad to EU countries (Poland, Germany, the Czech Republic, Italy, Spain, etc.) increased sharply. A certain share of citizens emigrated to the aggressor country for various reasons. Many EU countries have adopted special programs to support Ukrainian refugees, facilitating access to the labor market. Challenges such as the uncertainty of war, the narrowing of employment, structural and qualitative changes, forced migration, and large-scale mobilization movements have deepened employment problems.

Finally, higher education in Ethiopia is closely linked to increased migration for better economic opportunities (Schewel and Fransen 2018). Skill mismatches, more so than socio-economic or political factors, drive emigration. Over 40% of university graduates struggle to find relevant jobs, prompting both skilled and unskilled workers to migrate, primarily to Northern European countries, the Middle East, and Africa. In Africa's second-most-populous nation, with 54% of the population of working age, but 19% unemployed, internal displacement, rural–urban migration, and outward flows to Europe create chronic shortages of advanced technical and digital skills. The case of Ethiopia represents a low-income, high-growth context where demographic pressure meets limited job creation—a fundamentally different context to the other three cases.

2.4. Theoretical and Empirical Findings

The study of labor migration, skill shortages, and mismatches has yielded a rich body of theoretical and empirical research. Theoretical models often draw upon human capital theory, which posits that education and training are investments that enhance an individual's productivity and, consequently, their earning potential (Gulek 2024). Empirical studies provide evidence of a "brain drain" from less-developed to more-developed regions, driven by the search for better economic opportunities and higher returns on human capital investments (Pham et al. 2023). This phenomenon can significantly impact the availability of skilled workers in the labor market, especially in the case of developing countries. It has been observed that brain drain can hinder economic growth and innovation in the countries of origin (Marchiori et al. 2013), and since it diminishes the human capital in these countries, it can reflect negatively on the adoption of technological advancements, which is key to economic competitiveness. Simultaneously, labor market gaps are created that are difficult to fill, especially in specialized sectors (Ghazali et al. 2015). As per Chen et al. (2024), it is often considered that weak institutional capacities and inadequate policies in developing countries, which we also seem to observe in our cases, contribute to brain drain by failing to prevent the outflow of domestic talent. Moreover, education policies that are aimed at increasing the skill level of the national workforce are less effective (Pires 2015), as the benefits of such policies are often lost when qualified individuals emigrate.

Research also indicates that migrants often face challenges in the recognition of their qualifications and skills in the destination country, which can lead to occupational downgrading and underutilization of their human capital (Gökbayrak and Çalışır 2024; Hrynkevych et al. 2023). By employing various economic models and detailed statistical analyses, researchers aim to quantify the impacts of migration on wages, employment levels, and economic growth. For instance, studies have analyzed the effects of migration on labor market outcomes, such as with regard to the influx of Syrian refugees in Türkiye (Gulek 2024) and the challenges faced by workers in adapting to new environments (Kavak 2023).

Global mobility trends are shaped by a confluence of factors, including conflicts, economic disparities, demographic changes, and policy environments. The ongoing conflict in Ukraine, for instance, has led to significant displacement, with millions fleeing to neighboring countries and beyond (Duszczyk and Kaczmarczyk 2022; ILO 2022). Global mobility trends reflect the dynamic interplay between economic opportunities, social factors, and policy frameworks. The movement of people across borders is influenced by the search for better employment prospects, higher wages, and improved living conditions (ILO 2023). Technological advancements and the rise of digital platforms have also facilitated mobility, enabling individuals to seek opportunities beyond their immediate geographical confines. The European Training Foundation (2017) highlights that significant migration flows are driven by both push factors in countries of origin, such as political instability, economic hardship, and lack of opportunities, and pull factors in destination countries, including demand for specific skills and better living standards.

Regional contexts significantly influence migration patterns and the integration of migrants into labor markets. For example, the Western Balkans have experienced substantial emigration, driven by factors such as high unemployment, low wages, and political instability (OECD 2022). The European Commission's report on Ukraine (The European Commission 2024) emphasize the impact of regional conflicts and economic conditions on migration flows. Deimantas and Şanlıtürk (2023) highlight the challenges faced by Ukrainian refugees in Lithuania, particularly in terms of language barriers and recognition of qualifications. Similarly, studies by the State Audit Office of the Republic of North Macedonia (2024) and TEPAV (2023) underscore the importance of addressing regional

disparities and enhancing the capacities of local institutions to manage migration effectively. Crucially, North Macedonia, Ukraine, Türkiye, and Ethiopia, to a certain degree, have aligned their national qualifications frameworks with the European Qualifications Framework (EQF). Besides the notable aspirations of the first three countries for EU integration and alignment with the European labor market, this is essential for labor migration. After all, it facilitates the recognition of domestic credentials abroad and, symmetrically, return migration, because it eases individuals' reintegration into domestic labor markets after acquiring skills and qualifications abroad.

The complex interplay between labor migration, human capital, and labor market outcomes necessitates a multifaceted approach to policy interventions. The findings from various studies and reports underscore several key themes:

Education and Skill Mismatch: The mismatch between the skills acquired by workers and those demanded by the labor market remains a significant challenge. Efforts to align educational curricula with labor market needs are crucial for reducing this gap. This includes promoting vocational education and training (VET) programs that are responsive to industry demands and ensuring that workers have opportunities to upskill and re-skill throughout their careers.

Impact of Conflict and Displacement: Conflicts and displacement, such as the wars in Ukraine and Ethiopia, have profound effects on migration patterns and labor markets. These events necessitate both immediate humanitarian responses and long-term strategies for integrating displaced populations into host labor markets. The integration challenges are multifaceted, involving issues of language, recognition of qualifications, and social cohesion.

Policy Coherence and Institutional Capacity: Effective migration management requires coherent policies that address the various dimensions of migration, including labor market integration, social inclusion, and protection of migrants' rights. Strengthening institutional capacities, particularly in regions with high emigration rates, is essential for implementing these policies effectively.

Role of Diaspora and Remittances: Diasporas can play a significant role in the economic development of their countries of origin through remittances, investments, and knowledge transfer. Policies that facilitate diaspora engagement and promote their contributions can enhance development outcomes.

Data and Research: Further research is needed to understand the dynamics of migration and its impacts on both origin and destination countries. This includes longitudinal studies on the outcomes of migration for individuals and communities, as well as analyses of the effectiveness of different policy interventions.

Addressing the challenges posed by migration requires a comprehensive approach that considers the interplay between education, labor markets, and migration policies. By fostering an environment that supports the development of human capital, facilitates the integration of migrants, and promotes inclusive growth, countries can better manage migration flows and harness their potential for economic and social development.

So far, studies have rarely merged skill shortages, mismatches, and migration all together and looked at how these phenomena interact in the context of low- and middle-income countries as the origin of migration (McGuinness et al. 2018). Comparative studies that do look at this nexus still focus on OECD members, even though emerging evidence shows that the simultaneity of shortages, mismatches, and emigration can suppress productivity growth by as much as one percentage point a year in non-EU transition states (Cedefop 2015; World Bank 2021b). This being the case, there is a growing need for a multi-country exploration that can provide insights into the different contexts and mechanisms that form mismatches, shortages, and overall labor migration.

Our study adopts a comparative case approach that integrates countries that vary in terms of their demographic, income level, conflict exposure, and even the characteristics of their migration flows. Combining stakeholder interviews with secondary labor market microdata allows us to capture a firm-level labor environment that is invisible in official statistics, but can be decisive for policy design (Korstjens and Moser 2017). Qualitative content analysis embedded in a mixed-methods framework (Creswell and Plano Clark 2018) has repeatedly been shown to outperform purely quantitative diagnostics when institutional data are characterized by having low quality or high measurement error, as is the case in our four country cases (Bartlett and Vavrus 2017). By pairing this methodology with a sectoral approach that compares capital-, skill-, and labor-intensive industries, the study can isolate specific factors, contexts, and policy responses to skill mismatches and shortages. Subsequently, the following methodological approach is justified in cases such as these, where rich microdata is unavailable and conventional methodologies cannot be applied.

3. Materials and Methods

3.1. Framework and Research Design

Researchers from North Macedonia, Türkiye, Ethiopia, and Ukraine carried out the methodology of the study in 4 blocks of tasks, including the following: (1) preparation of the methodology and research tools; (2) analysis of available official statistical data and specialized publications; (3) conducting interviews and focus groups with stakeholders on changes in the demand and supply of qualified labor in the national economy; and (4) analysis of the data obtained and preparation of a comparative study. For this purpose, a dual methodological approach was utilized, involving descriptive and trend analysis of secondary data obtained through international and national statistical databases, and by conducting an open-ended question-based interview with companies, educational institutions (HEIs and VET institutions), policy creators, and labor market intermediaries, while focusing on the manufacturing, hospitality, and information and communication technology sectors. The study considered a sample of respondents (namely companies) who were selected to create a heterogeneous group based on their size, their sectoral importance, and the importance of their provided products or services to the national economy, while taking into consideration the regional distribution across the four countries. Subsequently, the study employed a maximum variation sampling strategy (Patton 2015) to capture the diversity in firm sizes and ownership forms within each economy. This approach is widely recommended in comparative labor market studies, because it allows heterogeneous patterns, while still retaining contextual saturation with relevant information. The minimum number for the total respondents of all segments was set to 40. This was conducted ex ante to ensure a small but analyzable sample for each country–sector stratum, thus satisfying the cross-case recommendations of Yin (2018) for multiple-case designs. The design of the methodological approach is visually portrayed in Figure 1.

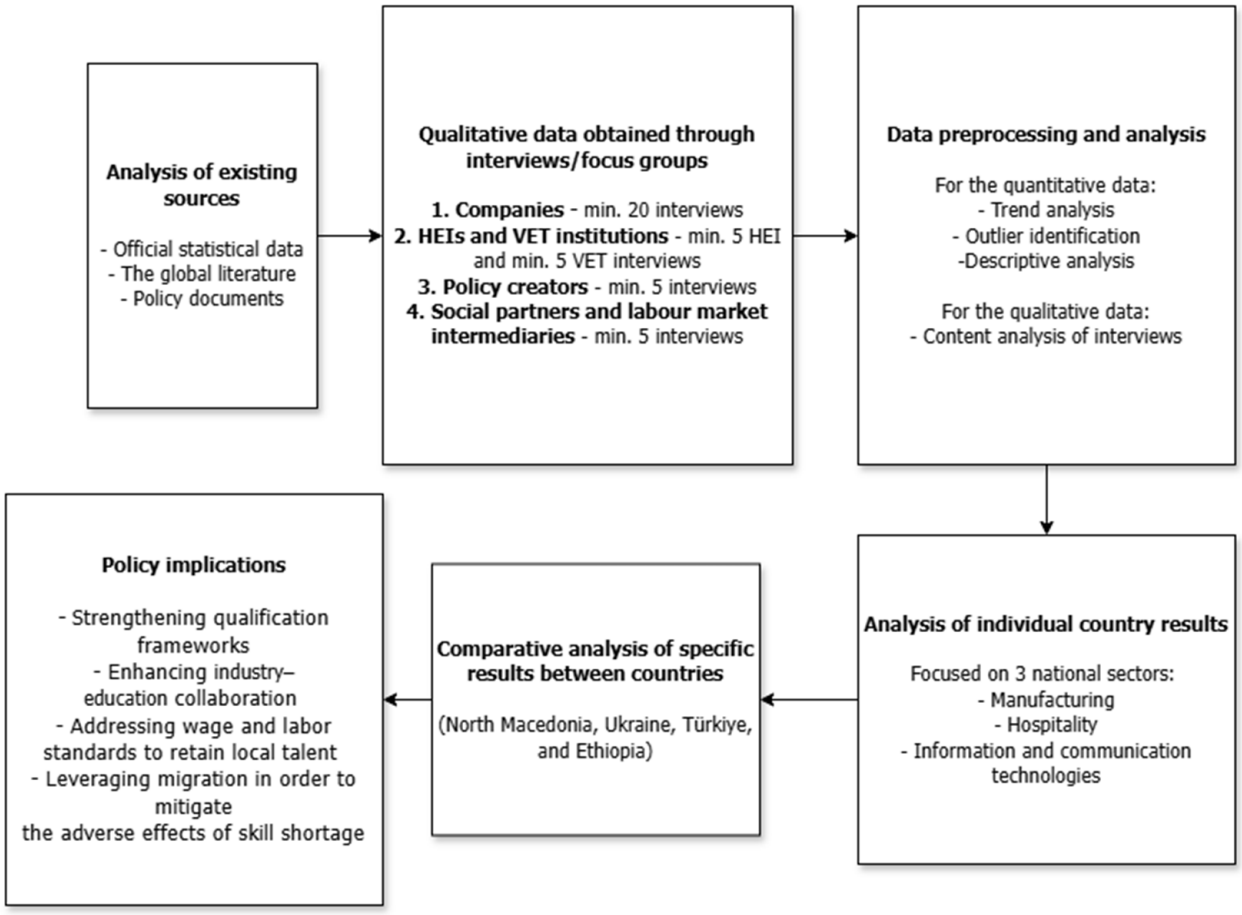

Figure 1. The workflow of the methodological approach.

3.2. Procedure and Data Collection

Several general approaches and criteria were methodologically defined for conducting the interviews with companies' representatives. These included that the duration of interviews conducted through a face-to-face approach or with a focus group should not exceed 1 hour, and that the online questionnaire should be presented in English or the national language. Online distribution was conducted only in cases where physical contact could not be established, and was designed to help Ukrainian companies participate in the study. The content of the research questionnaires was designed to fully comply with common ethical standards, with permission to conduct the survey and protection of personal data considered the most important factors. In this regard, the subsequent content analysis of qualitative results does not allude to any of the respondents, and commonly refers to each participant just as a "respondent". Notably, each country could add country-specific questions in addition to the mandatory set of questions, with their number being limited to a maximum of 25% of the mandatory set.

To study opinions on the matching of qualifications to the needs of the labor market, a standard questionnaire was used, consisting of 21 profile questions grouped into 5 thematic blocks. To study the opinions of representatives of educational service providers, a standard questionnaire was used, consisting of 25 thematic questions grouped into 8 thematic blocks. The criteria for selecting respondents for higher education institutions were different types of universities (classical, national, state, municipal or private, etc.); regional location/representation and/or the presence of separate structural units; the availability of a large number of areas of training, particularly, specialties significant for the entire country; and the respondent's affiliation to positions no higher than the faculty. For vocational

education and training institutions, the criteria were training in multidisciplinary and consolidated qualifications; training of workers for the service sector and types of economic activity in the region of location; absence of reputational risks; and recognition among users and consumers of specialized educational services. The interviews of policy providers (at the national and regional levels) in the field of employment and labor market policy and in the field of education and training covered a wide range of state and regional policies in the fields of education, employment, the labor market, education and training, labor and forced migration, and interaction with stakeholders at different levels of government. The core questionnaire consisted of 13 questions across 6 thematic blocks for the first group, while for the second group of respondents, the total number of questions was 15, across 6 segments.

3.3. Country-Specific Adjustments

It should be noted that each country included in the study, primarily North Macedonia and Türkiye, applied specific national variations, in addition to typical methodological approaches. For Ethiopia, the results were presented under three main categories: findings from companies, HEIs and TVET colleges, and policy providers and social intermediaries. It was more difficult for the researchers from Ukraine to adhere to typical methodological approaches. This is because virtually all spheres of the country's socio-economic life have 2 periods of development: before 2022 and during the active war. Indicators, trends, strategies, and plans before the war have, in many cases, lost their relevance. The decline in gross domestic product, jobs, employment rate, and the standard of living of the population during the war has fallen from a third to half.

Ukrainian researchers analyzed statistical and bibliographic data from early 2022 to mid-2024, while occasionally incorporating pre-2022 comparisons for employment and educational indicators. Notable labor shortages or surpluses in the aforementioned sectors were identified using a proprietary methodology (based on current data from the State Employment Service of Ukraine) that calculates the ratio of supply and demand for qualified personnel by profession. The researchers also adapted four standard questionnaires to Ukraine's wartime context, expanding them by about 20–25% of the total number of questions to address issues such as the impact of conflict on training, forced displacement, digitalization of workplaces, and the use of female labor in difficult work conditions.

Our approaches to comparing the results of the studies in the 4 countries and compiling them into a single research thematically observe several aspects. First, we summarize and compare the lists and descriptions of publications on the labor market, the market of educational services, qualifications, and migration, which were formed by selecting the most significant published materials for each country, according to their international recognition and use. Published results of comprehensive studies dedicated to migration processes and problems with their regulation in the country of departure and countries of arrival of migrants of different categories are described separately. When selecting publications, preference was given to those published in English, although national documents of key importance were also considered. Second, the analysis of key indicators and the results of statistical and other studies on the development of qualifications, their application, shortages or surpluses, outflow of skilled labor outside the countries of origin, etc., were interpreted by firstly comparing comparable values by demonstrating extreme values, dynamic series, and lists of trends of interstate similarity or, conversely, differences; and secondly, compiling a separate description of the key characteristics of countries where there are specific factors of influence, for example, Ukraine and Ethiopia. Third, based on the answers to the interviews of key stakeholders from the 4 countries, content analysis, and careful systematization and analysis of the answers, conclusions were formed on the

topic of the study based on similar questions, and similarities or differences in the responses of stakeholders were determined. Additionally, the results of interviews with experts on problems specific to a particular country are highlighted as examples.

The methodological approach was conducted in two linked steps. In the first step, secondary labor market data sourced from national and international databases were used as a scoping device to indicate the sectors deemed the most significant to the national economy, and the presence of skill mismatches or shortages, thus identifying that the ICT, manufacturing, and hospitality sectors are mutually important for the four countries. Next, in the second step, interview transcripts and open-ended questionnaire responses were read repeatedly by two researchers per country, who used manual, line-by-line coding and constant comparison to surface recurring concepts (Braun and Clarke 2006). Coded pieces were then sorted into themes based on the questions at hand, discussed in several team debriefings, and refined until a final version was built. A simple Excel matrix listed themes (represented by the questions in the survey segmented in rows) against stakeholder groups (in columns), allowing for a transparent cross-case comparison of convergent and divergent findings (Miles et al. 2014).

3.4. Respondent Distribution Across Countries and Sectors

The final sample studied per country was as follows. In North Macedonia, 29 companies' representatives were interviewed across five main sectors: manufacturing (10); electricity, gas, steam, and air conditioning supply (2); financial services (6); information and communication technologies (7); and accommodation and food services, i.e., the hospitality sector (4). Consequently, the three sectors at the focal point of this accounted for 75% of all the companies studied. Regarding the education institutions, a total number of 6 HEIs and 4 VET institutions were interviewed. On the other hand, we interviewed 5 core respondents from each of the remaining two target groups, i.e., policy creators and labor market intermediaries, and social partner organizations.

In Türkiye, 37 interviews were conducted in total. Based on the sectors with labor shortages in the last five years, as indicated by İŞKUR, a total of 19 company managers were interviewed, from sectors such as furniture (1), welding (1), textiles (2), footwear (1), administrative and support services (private security, 5), accommodation and food services (hotel, 1), education (3), and software (5). Regarding the educational institutions category, interviews were conducted with 15 educational institution administrators working at secondary education, higher education, and vocational education centers. Finally, in the policymaker category, three participants from national and regional policy providers and social partners contributed to the research.

In Ukraine, 22 representatives of companies in five main sectors were interviewed: manufacturing (12); information and communication technologies (5); electricity, gas, steam, and air conditioning supply (3); and financial services (2). Thus, the two sectors that are in the spotlight and most characteristic of the country account for 77.2% of all companies surveyed. Regarding educational institutions, it should be noted that a total of 12 providers of educational services were interviewed, of which 6 represented universities, and 6 represented vocational colleges and vocational schools. Seven lead respondents from each of the two target groups were also interviewed, i.e., policymakers, labor market intermediaries, and social partner organizations. In addition, 35 stakeholders were additionally interviewed in Ukraine from among employees and workers of enterprises, institutions, institutions, and organizations of various types of economic activity that use digital devices, technologies, and communication tools in their work. People responsible for adult education, including in-service training, were covered, as well as those dedicated to the role of digitalization in changing learning in extreme (pandemic, war) conditions.

Similarly, in Ethiopia, 20 companies were included in the study across key economic sectors: manufacturing industries (10), construction industries (2), and service sectors (8) including financial sectors, Telecom, health, education, and hospitality. Regarding the training providers, a total of 5 HEIs and 6 VET institutions were included in the study. In addition, we collected data from 9 key informants drawn from policymakers, labor market intermediaries, and social partners.

4. Results

4.1. Manufacturing Sector

4.1.1. The Importance of the Manufacturing Sector and Ukraine's Case Under Martial Law

Since the full-scale war began in 2022, Ukraine's manufacturing sector has faced severe disruptions. Despite a slight economic revival in 2023, challenges persist, particularly a mismatch between worker qualifications and employer needs. War-related uncertainties, migration, and mobilization have further narrowed employment opportunities, deepening labor market structural shifts. Many enterprises have adapted by shifting from civilian to military or strategically critical production, driving demand for specialized skills in defense, logistics, IT, and energy. Employers are increasingly adopting innovative technologies and automation, requiring workforce upskilling to enhance competitiveness. However, despite an overall labor surplus, industries struggle to fill vacancies due to skill mismatches. Statistically, the sector has experienced a notable contraction in job openings in recent years. From 2020 to 2023, the State Employment Service recorded a 60.3% drop in overall registered vacancies (from 829,653 to 329,436) in Ukraine, with the manufacturing sector alone losing 85,000 vacancies during this period. This significant reduction was most pronounced in the food industry (by 21,638 vacancies), in the production of other non-metallic mineral products (by 8790 vacancies), and in the wood processing industry (by 6245 vacancies). The most affected subsectors include the food industry, non-metallic mineral production, and wood processing. By 2023, only about 40.4% of the manufacturing vacancies present in 2020 remained. Concurrently, the relocation of businesses and people to safer regions has led to an uneven distribution of jobs, altering the demand structure for various skills and professions. For example, the number of vacancies in the occupational group "Workers for the maintenance, operation, and monitoring of the operation of process equipment, assembly of equipment and machines" in 2023 was 18.4% of the total number of vacancies, a decrease compared to its peak value of 24.9% in 2022.

The Macedonian labor market is facing the dual challenges high unemployment and significant labor and skill shortages, which are continuously emphasized. One of the main drivers of the national economy is the manufacturing sector; however, significant challenges persist. For instance, the National Employment Strategy (Ministry of Labour and Social Policy 2021) highlights a clear wage gap in manufacturing, where women are predominantly employed (especially in textile production), contributing to gender discrepancies. Also, based on data from the Employment Service Agency (2023), 45.6% of employers were expected to create 14,915 new jobs within the following 12 months, with large employers (250 or more employees) accounting for 43.1%, and the manufacturing sector was expected to contribute the largest proportion of new jobs (51.2% in total). Full-time employment was pronounced, with almost 99% of all employees in this sector. Related to skills and occupation demand, employers emphasized the demand for workers with primary and secondary education, particularly in the manufacturing and retail sectors. For example, 45.5% of new jobs in manufacturing were expected to require primary education, while 44.5% required secondary education. This demand was notably pronounced for general laborers, machine operators, and tailors. Discrepancies in the Macedonian manufacturing

sector have existed for years, where, until 2017, a lower statutory minimum wage was employed compared to other sectors.

Based on data from the State Statistical Office, men tend to experience longer duration spent unemployed, which should, in turn, be significantly reflected in industries requiring specific skills, such as manufacturing. Moreover, with an average wage of MKD 20,911.2 (approximately EUR 340), the manufacturing sector in North Macedonia is consistently among the lower-paid sectors, well below the national average. When designing this study, it was also interesting to observe how the hospitality and the ICT sectors rank on this scale, and to understand the combination of both top and bottom earners, as shown in Figure 2. In turn, employees in such sectors tend to be the top candidates for the emphasized emigration in the country. Nevertheless, the manufacturing sector contributes roughly 25% of the total occupied jobs, which highlights its importance to the national economy. On the contrary, with roughly 30% of total job vacancies on average (1.89% job vacancies), the manufacturing sector remains the most significant in this segment, with plant and machine operators and assemblers being among the top vacant positions.

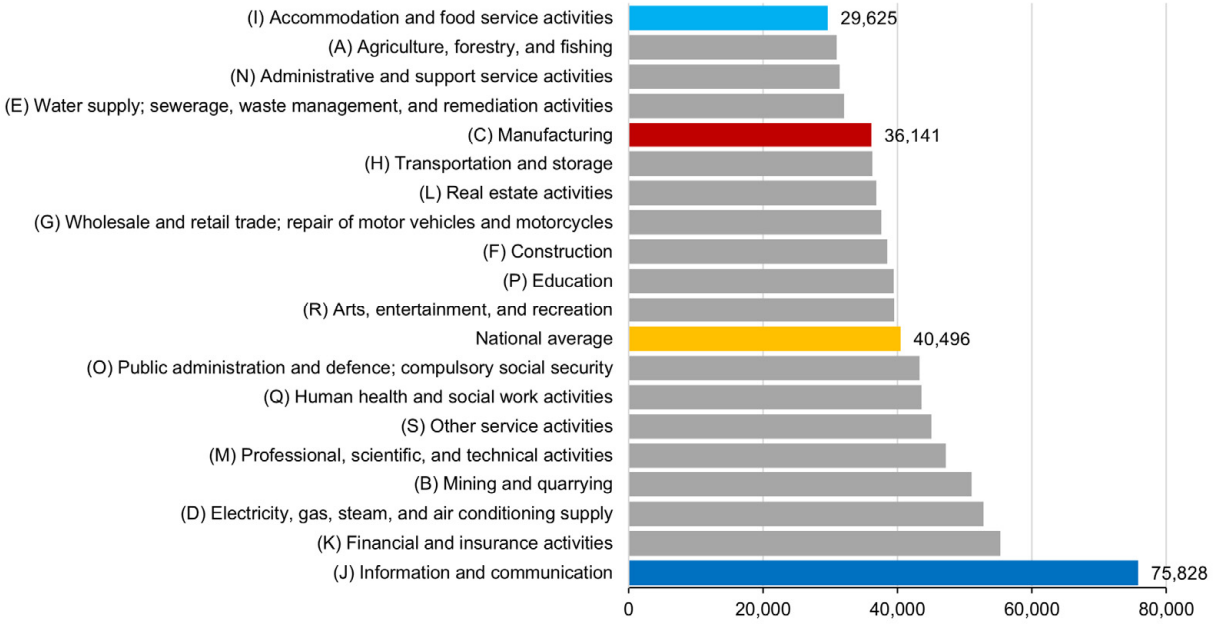

Figure 2. Average net wage paid by sectors of activity in North Macedonia, in Macedonian Denars.

4.1.2. Labor Migration and Its Impact on Manufacturing—Why Does Türkiye Stand Out?

Migration continues to both exacerbate and mitigate sectoral challenges. Highly qualified workers fleeing abroad create workforce shortages in crucial industries, while internal displacement saturates job markets in safer regions, intensifying the need for robust vocational training. As a result, there is strong demand in manufacturing, particularly in clothing production. Yet, factors such as insufficient pay, declining job prestige among youth, and disrupted production lines due to the war have worsened the skills gap. In the qualitative study conducted, roughly 38.5% of participating companies blamed labor shortages on the forced relocation of workers, which highlights the crucial role of conflict-induced migration in reshaping Ukraine's manufacturing labor market.

Migration is one of the key drivers of Türkiye's labor market discrepancies. Characterized by significant emigration, leading to brain drain (estimated at 4.4% in manufacturing and construction) and employment gaps, the Turkish economy is supported by immigrants who predominantly come from the Syrian Arab Republic. The textile, garment, leather, and shoe industries are the most common employment areas for refugees in the manufacturing

industry (Ministry of Labour and Social Security 2023). Syrians work mostly in informal work conditions and in sectors such as trade, construction, and manufacturing, which account for 79.1% of their work, and these are followed by the informality-based textile, clothing, leather, and footwear industries, where 30% of working Syrians are employed (Pinedo Caro 2020). The manufacturing sector, as indicated by Donat (2024) grew at almost a stagnant rate in 2023, with an annual growth of 0.8%. Its importance lies in the fact that it is one of the sectors with the highest numbers of paid employees (a total of 4,648,371 employees as of January 2024). According to the past five labor market reports by İŞKUR, among the highest jobs in demand are those related to the garment industry, with sewing machine operators, and the manufacturing sector, where welders are insufficient in number.

According to the OECD (2023), more than 80% of employers in Türkiye face difficulty in filling vacant positions, especially in middle-level skills and blue-collar jobs. Such shortages are especially notable in the manufacturing sector (notably in the garment manufacturing industry), with most vacant positions remaining unfilled due to a lack of professional skills or insufficient work experience. As noted by a respondent in the study, the reasons for the labor shortage for occupational groups (sewing machine operators in the textile industry, manufacturing workers, welders, and wooden furniture carpenters) are mainly as follows:

> *"...lack of applications, dissatisfaction with the work environment and conditions, lack of professional skills, and inexperience".*

The qualitative analysis offers a unique insight into Türkiye's labor market situation regarding the manufacturing sector. Out of the analyzed 19 companies, 89.5%, stated that they experienced problems in sourcing skilled labor for their sectors or companies. Respondents noted that "*processes in administrative units progress more smoothly compared to production departments*", and that they face a small number of responses across all areas and departments of production. It was also noted that among the easiest professions and qualifications to find are unskilled jobs, such as warehouse workers and manual labor, that do not require expertise. Professions such as machine operators in the manufacturing sector are noted to be among the most easily filled roles, despite having issues related to qualifications, attributed to an oversupply of trained workforce in these fields, combined with deficiencies in their training processes.

Labor shortages in Türkiye's manufacturing sector are mostly compensated by hiring migrant workers. However, there were notable cases of respondents indicating that they avoiding hiring migrants due to challenges such as language barriers, legal difficulties, and skill mismatches. In the manufacturing sector, there were notable findings alluding to gender discrepancies, with one respondent noting that

> *"Women are generally preferred for garment production, packaging..."*

The interviews with enterprise representatives point out that there is a shortage of qualified workers in the production and service sector, such as garments, weavers, furniture masters, machine operators, and those in professions that can be regarded as intermediate staff.

In Türkiye, companies noted the importance of migrants in low-skilled manufacturing or hospitality occupations, but complained about the "*loss of highly qualified employees*" to the European and North American markets. In Ethiopia, even though a less pronounced trend of emigration to Western countries was noted compared to the other three countries, intense internal displacement due to ongoing conflicts was noted. This worry was emphasized by one of the respondents, who noted:

> *"Many employees are withdrawing from local companies and migrating to Arab countries... This challenge will continue and be stronger".*

In the qualitative study, it was found that the manufacturing industry contributed 32% of all analyzed companies. Respondents mentioned a limited supply of "*welder, coil winders, transformer fitters, transformer testers*", with some of these occupations being more difficult to find as they are "*dying out*", and some pointed out occupations such as "*C-class drivers and manual labor*". Approximately 39% of companies believed that there had been no new qualifications in demand in the recent period, with nearly 45% of them being from the manufacturing sector. It is encouraging that out of the analyzed sample of firms, approximately 75% reported actively collaborating with educational institutions to enhance skill development. Internships and practical training programs are widely implemented, especially in the manufacturing industry. In the sector, 77.8% of respondents perceived emigration as a serious threat to operations, and companies mainly mentioned investing in employee training and collaboration with educational institutions to tackle skill shortages and mismatches.

4.1.3. Skill Mismatches and the Role of Ethiopian TVET Institutions

Ethiopia has faced a growing demand for skills, driven by economic restructuring and technological advancements. This has been mostly spurred by the government's ambitions to transform the country into a middle-income economy, with the manufacturing and construction sectors being the main drivers. Each year, the Ethiopian labor market is expanded by 2 million new entries, on average. There has been a notable rise in mid- and high-level qualifications, especially in the manufacturing sector. Additionally, job postings requiring tertiary education increased from 25% to 40% between 2015 and 2020. Vocational qualifications have also gained importance in construction and agriculture, emphasizing technical ability (African Development Bank 2020; World Bank 2021b, 2024). On the other hand, Ethiopia's growing pool of graduates highlights a mismatch between educational outputs and market needs. It is worth noting that TVET institutions contribute to skill development, but face challenges in meeting demand in manufacturing and construction. Based on the qualitative findings, almost all employers, including those in the service sector, interviewed expressed a high demand for employees with technical and practical skills who can lead and execute operations. For example, manufacturing companies find it difficult to gain access to applicants with high qualifications and the advanced technical skills needed to "*effectively manage the production process and finishing*", as one respondent noted. Also, the respondents in the qualitative part of the study noted that machine operators are tough to find, and such experts are mostly imported, with one of the core problems found in the lack of practical work during education. Similarly to the cases of the other studied countries, it was noted that graduates attain mostly theoretical knowledge, which, in turn, creates a skill mismatch when entering the labor market. This was noted as one of the main reasons for underemployment in the country.

4.1.4. Shortages and Migration-Induced Workforce Gaps in Manufacturing

The persistence in skill shortages and labor market mismatches seems to be induced by several key aspects, such as insufficient practical training and the ongoing mismatch between educational outputs and labor market needs. For instance, in the manufacturing sector, employers across the analyzed countries seemed to note that traditional and more technical education lacks hands-on experience, which is necessary for advanced industrial processes. An Ethiopian manufacturing firm representative who was interviewed explicitly noted this problem, where graduates possess sufficient theoretical, rather than practical, knowledge:

"No university or polytechnic colleges are graduating professionals that meet our company's expectations… All new employees have one thing in common: they lack practical skills".

This leads to a lack of a skilled workforce in machine operation and machine maintenance, and even of workers who possess knowledge of the next-generation technologies in this sector. Notably, this is spurred by pronounced migration. For instance, a respondent from Ukraine highlighted the difficulties faced in maintaining production lines:

"It is a rather serious challenge today. We face difficulties in attracting and retaining personnel due to the effects of war… The shortage of labor is caused by the departure of qualified workers abroad and by internal migration".

Ethiopian manufacturers, for instance, noted the scarcity of high-level machine operators, while Macedonian employers highlighted the difficulty of finding specific occupations that seem to be "*dying out*", such as welders, coil winders, and transformer fitters. In the hospitality sector, a shortage of trained service workers, such as cooks, waiters, and receptionists, is quite common.

In Ukraine, war-related challenges have introduced skill mismatches and forced relocations and emigration, hampering an already strained manufacturing sector. Meanwhile, Türkiye faces labor shortages amid a brain drain, partially offset by the influx of migrant workers, particularly Syrians, who fill entry-level positions, but face challenges due to pronounced informality and legal constraints. North Macedonia's modest wages and persistent skill deficits similarly fuel emigration, especially among manufacturing employees. Across these contexts, migration both worsens and mitigates workforce imbalances. The emigration of trained personnel intensifies shortages, while incoming workers ease some labor demands, although not always in line with employers' specific needs. The manufacturing sector in Ukraine is characterized by war-induced sectoral shifts, where some firms transition to defense production and specialized logistics, which potentially create new skill gaps (e.g., advanced engineering and IT-based manufacturing). As one Ukrainian employer notes,

"Mobilization, frequent alarms, power outages, lack of analysis of the real needs of the labor market… are big challenges".

However, even besides the forced migration, official data show a 60% drop in overall registered vacancies since 2020, with the food and mineral product subsectors most affected. In Türkiye, garment manufacturing, footwear, and textiles rely heavily on refugees, even despite language barriers and legal hurdles. Additionally, Welders, machine operators, and carpenters remain high in demand. One interviewee observes that

"At the end of our interviews, if we cannot find personnel with the required qualifications, we prefer to end our search… rather than leave the position unfilled".

With an average wage of approximately EUR 340 in manufacturing, many skilled workers in North Macedonia opt for jobs abroad. As already noted, welders, tailors, and coil winders seem to be job positions that are increasingly hard to fill. In Ethiopia, rapid manufacturing expansions reveal a shortage of advanced machine operators and technical engineers.

4.1.5. Common Sector-Wise Challenges

Even though the four countries' cases are distinct by default, the study shows that common challenges exist when the manufacturing sector is analyzed. For instance, even though, in two cases, low wages and gender/informality issues arise explicitly, it is more common for the manufacturing sector to experience practical skill mismatches, migration-induced

shortages, and specialized occupational shortages (see Figure 3). This can be partially attributed to overly theoretical educational systems producing graduates that require sufficient investment in additional training, and both internal (typical for Ukraine and Ethiopia) and external displacement (North Macedonia and Türkiye) of the labor force actively seeking better job opportunities.

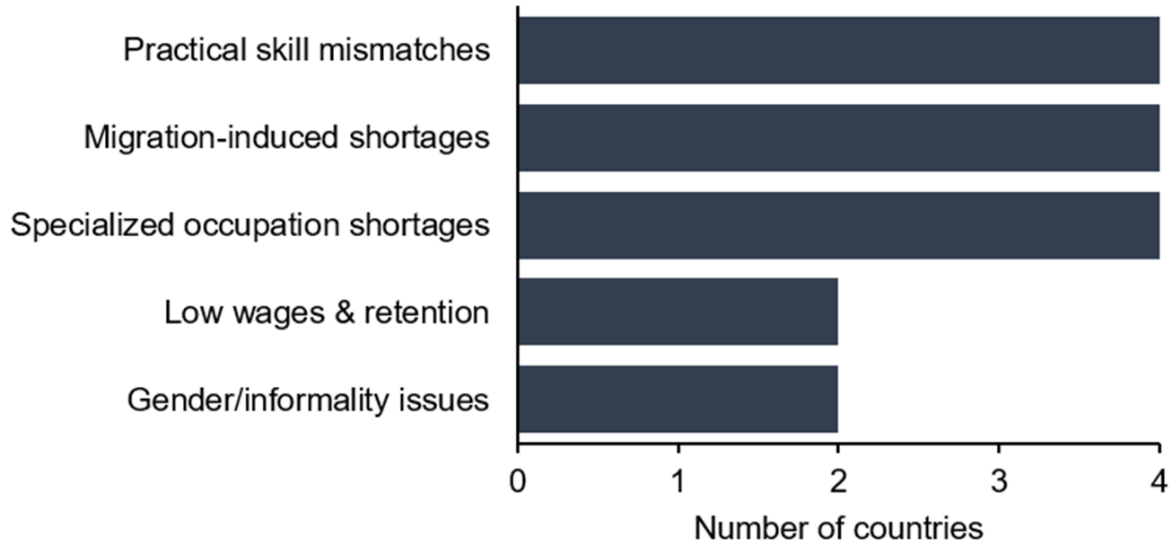

Figure 3. Cross-cutting challenges in the manufacturing sector.

Table 1 summarizes the key challenges identified for the manufacturing sector across the interviews with stakeholders. Across the four countries, the manufacturing sector faces acute labor shortages, with difficult-to-fill roles including defense engineers, machine operators, tailors, welders, and technical engineers. On the other hand, skill mismatches are driven by diverse challenges. For instance, Ukraine faces war-induced shifts in demand, North Macedonia suffers from wage-related retention issues, Türkiye struggles with unattractive mid-level-skilled jobs and poor training, and Ethiopia's training capacity lags behind its rapid industrial growth. Migration exacerbates shortages in all countries, ranging from mass emigration and internal displacement in Ukraine and Ethiopia, to brain drain and refugee labor (predominantly Syrian) in Türkiye. Wage-related issues are significant in North Macedonia and Türkiye, while in Ethiopia, the problem lies more in applicant qualifications, rather than pure wages. It is also worth noting that common challenges identified across all contexts are deficits in practical training, high demand for technical roles, and reliance on upskilling, automation, or migrant labor as coping strategies for persistent shortages.

Table 1. Key manufacturing sector challenges identified in the interviews.

Theme	Ukraine	North Macedonia	Türkiye	Ethiopia
Most demanded/difficult-to-fill occupations	Defense-related engineers; process/equipment operators; logistics and IT specialists	General laborers, machine operators, tailors; "dying-out" trades (welders, coil-winders, transformer fitters)	Sewing machine operators, welders, furniture carpenters, manufacturing workers	Advanced machine operators, technical engineers

Table 1. *Cont.*

Theme	Ukraine	North Macedonia	Türkiye	Ethiopia
Skill shortage drivers/mismatches	Wartime sectoral shifts require new technical skills; relocation of firms leaves local gaps	Low wages undercut retention; minimum-wage policy lag; demand concentrated in primary/secondary-skill jobs	Mid-level skill blue-collar jobs unattractive; training quality gaps; oversupply of under-qualified applicants	TVET delivers theoretical vs. practical skills; rapid industrial expansion outpaces training capacity
Impact of migration	Mass emigration and internal displacement drain qualified staff; mobilization disrupts workforce	Persistent emigration to higher-wage EU markets exacerbates vacant jobs	Brain drain of highly qualified workers; low-skilled job shortages partly filled by Syrian refugees (informal)	Internal displacement combined with outward migration to Gulf countries; firms import foreign experts
Gender/informality issues	n.a.	Women concentrated in low-paid textile work	Women preferred in garment lines; high informality among migrants	n.a.
Wage/retention issues	War-determined vacancy distribution in most cases	Average wage well below national mean; sustained pay gap in textiles	Pay and conditions cited as key reason why applicants refuse jobs	Wage discussion is muted; main issue is lack of suitably skilled applicants

4.2. Information and Communication Technology Sector

In the study, independently conducted across the four partner countries (North Macedonia, Türkiye, Ethiopia, and Ukraine), information and communication technology appeared as a highly relevant qualification and occupation, demanding and harboring many employees and supporting the economy of the respective countries. In North Macedonia, IT is recognized and treated as a core economic sector and a cross-cutting qualification required by all economic sectors. Conversely, IT appeared as a cross-cutting qualification for all sectors in Türkiye, Ethiopia, and Ukraine, with varying levels of significance.

Moreover, IT plays a mediating role across the different economic sectors of the four countries. For example, industries and employing organizations are aggressively implementing IT products and services in the production process, management of products, and service provision to remain competitive and productive in their sectors (see Ministry of Labour and Social Policy (2021), for North Macedonia; (Ethiopian Statistical 2021), concerning Ethiopia; Akin and Karadas (2023), in the case of Türkiye; and Schnitzer (2023), concerning Ukraine). With this understanding, the demands, supply, and shortages of IT skilled workers in connection to migration will be presented, comparing the four countries' current experiences.

The demand and supply of IT professionals in the partner countries can be considered from two perspectives: high-skilled and low-skilled IT professionals. Low- and medium-skilled ICT professionals who can support companies' administrative and routine activities are readily available in the market. Evidence from the four countries shows that HE and VET graduates can handle these jobs with a small amount of capacity-building support. For instance, in North Macedonia, IT professionals for software development and web design roles are easily available. In Ethiopia, fresh IT graduates and IT professionals for supporting administrative tasks are readily available from the market, and IT professionals are noted among the top occupations demanded in the Ethiopian labor market, based on

the interview responses (see Figure 4). Similarly, employers in Türkiye can access software and computer engineers locally. Lastly, Ukraine has a large pool of IT professionals, though the ongoing war has led many of them to evacuate (and Schnitzer 2023).

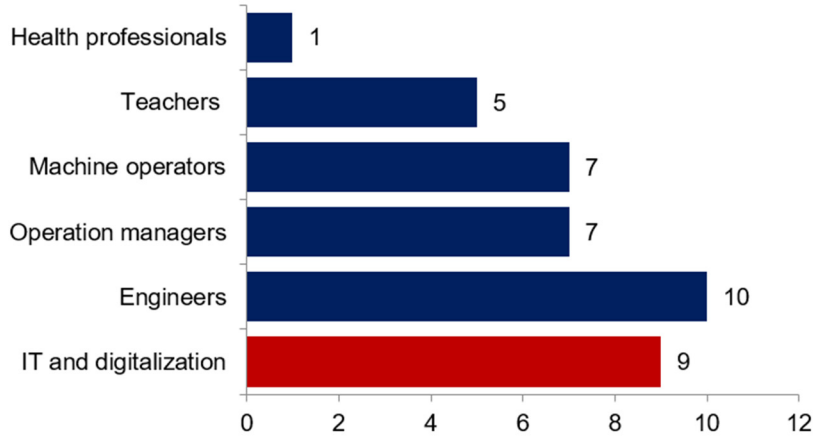

Figure 4. The top occupations demanded in the case of Ethiopia.

Therefore, the supply of new graduates from IT-related programs and IT professionals for medium- and low-level technical tasks exceeds the demand, leading to skill mismatches, whereby degree holders perform tasks that can be accomplished by non-degree holders.

4.2.1. Demand for ICT Professionals Across the Four Countries

The most critical skill shortage in the four countries is of high-level IT skilled professionals. The high demand for this profession has also made it one of the highest-paid. Companies across the four countries face challenges in accessing these professionals. For example, 32% of companies interviewed in North Macedonia reported difficulties in finding suitable professionals, including highly skilled IT personnel. International and large companies in Ethiopia are often forced to recruit highly skilled IT professionals from abroad, resulting in a drain of hard currency. In Türkiye, the shift towards automation, the application of artificial intelligence, and robotization have ultimately increased the demand for IT professionals. In war-ridden Ukraine, there is a growing demand for a large number of highly skilled IT professionals, particularly in the areas of security and ICT firms.

Advanced IT skills are also reported to remain the most wanted profession in the future if companies wish to cope with the technology-mediated, ever-changing labor market dynamics. Thus, the labor market dynamic requires not just a few employees with highly sophisticated IT skills per company to develop and manage the software behind production, management, and service provision processes, but also necessitates that the remaining employees be equipped to operate those technologies.

High demand for, concurrent with a limited supply of, sophisticated IT skills remains a common agenda across the four countries, though the nature, degree of demand, and coping mechanisms differ. Addressing the nature and reasons behind this change would support efforts to establish mutually beneficial and sustainable solutions.

The first reason behind the demand for skilled IT professionals in the four countries is the fact that all competitive industries worldwide have already moved towards, or are moving towards, integrating high-tech tools and products into their systems, which demands specialized IT professionals across all levels of production. Thus, specialized IT professionals are not only demanded by IT firms, but by all companies. The lack of graduates in both quality and quantity from training providers exacerbates the situation.

4.2.2. The Impact of Education on Emerging Gaps in the ICT Sector

The relevance, up-to-date, and practicality of curricula and teaching provided by HE and VET providers is the second reason for the skills gaps created. The study reports from North Macedonia, Türkiye, and Ethiopia show gaps from this perspective. Training providers have limitations in creating and conducting teaching that equips graduates with the high-level IT skills demanded by industries. Ukraine is in a relatively good position, as it takes decisive measures to attract competent students with a strong mathematics background and train them to become competent IT professionals, though the war with Russia has negatively influenced the process and the availability of graduates.

4.2.3. Migration of ICT Professionals

Internal displacement due to natural and man-made factors is another reason behind the low supply of highly skilled IT professionals. Firstly, war, as a man-made factor, and natural disasters, like earthquakes, disrupt the teaching and learning process, which affects both the quantity and quality of graduates. Secondly, in the context of turmoil, highly demanded and skilled workers are the first to leave their areas, either permanently or temporarily. They are in demand all over the country or internationally, so they easily move to safer areas. In North Macedonia, employers view emigration as a "*serious threat*", and this was specifically emphasized for the interviewed manufacturing and ICT firms. One respondent from the ICT sector in North Macedonia noted that

> *"Emigration represents one of the biggest threats to the labor market in North Macedonia".*

It is also a process that ICT firms usually do not have a strategy for. One of the respondents even mentioned that the problem might be systematic, by pointing out that

> *"From my perspective, it is an unstoppable process. People who leave are usually revolted by the system in the country (health, politics, education, etc.), not by the conditions in the company".*

In Türkiye, natural disasters like earthquakes, in Ukraine, the war with Russia, and in Ethiopia, the ongoing internal conflict over the last six years have typically displaced professionals, including IT experts, from their workstations, causing gaps. Therefore, North Macedonia is the only country among the four that has not recently experienced internal displacement due to war or natural disasters.

Another critical factor for the shortage of highly skilled IT professionals is migration. As indicated above, internal displacement due to conflict and natural disasters leads employees to move to safer areas where they can find job opportunities. Accordingly, skilled workers from Ethiopia and Ukraine have reported moving from conflict-ridden areas to safe regions or countries offering protection and work opportunities. Jobs in these areas are also closed or suspended and force workers to flee. For example, almost all companies in the conflict-ridden areas in Ethiopia experienced suspension of work. Similarly, in Ukraine, job opportunities were reduced by 30% compared to the pre-war level, and 4.6 million people lost jobs through the involvement of forced migration.

Beyond this, highly skilled IT professionals are in demand by developed countries, which offer better salaries and working conditions. This factor drains IT skilled workers from North Macedonia, Türkiye, and Ukraine to other European countries. In Ethiopia, better salaries are also a significant reason for the attrition and retention of employees with advanced technical skills.

4.2.4. Addressing Shortages in the ICT Sector

Different lessons have been drawn from each of the four partner countries' attempts to address shortages of highly skilled IT professionals due to migration and contemporary

issues. Ukraine is working hard on creating resilient companies by continuously training and upskilling workers and IT facilities, despite the loss of skilled workers due to migration and war. As a result, the qualifications of workers, especially in critical national security sectors, such as defense, logistics, IT, and energy, have increased. Additionally, all workers are provided with capacity-building training on new technologies and cyber security. Similarly, in-house training is used by companies in Ethiopia, where workers with advanced-level IT skills hired from abroad come with a mandate to train and coach local experts with similar training backgrounds, so that they can take over the roles after some time.

Migration of professionals to better-paying organizations and countries is inevitable, as long as the free movement of skilled workers is allowed. In these circumstances, the better way to attract and retain domestic skilled workers and returnees is by creating comparable working conditions at home. In this regard, the attempts of companies from North Macedonia and Türkiye can be taken as examples. One of the Macedonian ICT firms notes the following:

> *"We [the company] solve the problems with lack of qualifications and skills by cooperating with the continuous implementation of training workshops internally and in cooperation with external experts in the field, as well as by visiting conferences that are established at the world level, to monitor innovations and trends".*

Another respondent highlights the role that training centers have, by pointing out the following:

> *"We [the company] use all possible channels for recruitment, we emphasize the use of social networks for greater availability and personal recommendations from employees. We have cooperation with universities and Academies. Academies also produce candidates with great potential".*

A sustainable solution for skill shortages arises when education and training providers integrate high-level IT skills into their education and research. In this regard, North Macedonia's plan to expand digital training across multiple age groups, as well as Ethiopia's plan to integrate IT as a separate learning subject across all levels of education and its integration into each subject, can serve as examples. From an academic research perspective, Türkiye's plan to integrate IT-related issues and innovation into postgraduate research has significant potential for fostering successive technology-oriented innovation.

IT firms or other companies in need of high-level IT skills can also close the skills gap by closely working with training providers. In this regard, companies can approach training providers with the specific skills they require, and curricula can be jointly developed. Students' practice and research can be jointly supervised, resulting in benefits for the graduates, companies, and training providers. One IT-based company involved in the Ethiopia study successfully addressed the existing gaps by co-creating two master's programs with a training provider.

4.2.5. Common Characteristics and Challenges in the ICT Sector

Across North Macedonia, Türkiye, Ethiopia, and Ukraine, the ICT sector is viewed as a vital and transversal skill base, which is crucial for growth, automation, industrial upgrading, and strategic functions such as defense (especially relevant for Ukraine) and cybersecurity. Table 2 summarizes the identified challenges faced by the four economies and how stakeholders respond to them, based on interview findings. While low- and medium-skilled IT talent remains relatively abundant across all contexts, high-skill shortages are severe. Countries face critical gaps in advanced roles, such as senior software developers, data scientists, cloud experts, and cybersecurity developers, driven by curriculum lags, emigration, and rapid tech adoption and progress on a global scale. Furthermore,

labor migration, whether it is conflict-driven or economic, intensifies talent loss across all four countries. Such a phenomenon is especially pronounced in a work-flexible field such as ICT, where employees can work remotely or freelance and are not border-restricted. Despite these common challenges, firms predominantly adapt through upskilling, continuous development of university–industry partnerships, expert mentoring, and greater integration of IT into education. However, the recurring pattern is clear. While basic IT skills are adequately supplied, high-level talent remains scarce, and outdated curricula cannot keep pace with technological change. Cross-country coping strategies increasingly emphasize the rising need for education reform and internal workforce development, which, a priori, requires sufficient investment.

Table 2. Key ICT challenges and responses across the four study countries.

Theme	North Macedonia	Türkiye	Ethiopia	Ukraine
Role of ICT in economy	Core growth sector and transversal skill for all industries	Transversal skill; demand surging with automation/AI	Transversal skills; pivotal for industrial upgrading	Transversal skills; strategic for defense, logistics, and cybersecurity
Low-/medium-skill talent	Readily available (e.g., software dev, web design)	Adequate supply of software and computer engineers for routine tasks	Fresh graduates meet routine IT support needs	Large pool historically; still covers routine roles, despite war exodus
High-skill shortage intensity	32% of firms struggle to hire advanced developers/engineers	Sharp increase with robotization; shortages in data/AI specialists	Severe firms import experts, draining hard currency	Acute need for security, cloud, and advanced developers after wartime losses
Main shortage drivers	Emigration of talent; curricula lag behind advanced tech	Brain drain abroad; rapid tech adoption outpaces training	Insufficient high-level training capacity; curriculum gaps	Wartime displacement and evacuation; interrupted education
Migration impact	External emigration a “serious threat” to talent pool	Earthquake displacement and outward migration to EU	Conflict-driven internal displacement and outward migration to the Gulf	Mass internal/external displacement; 30% job drop vs. pre-war
Enterprise coping strategies	In-house and external workshops; educational institution partnerships; nationwide digital skills expansion	Improving working conditions; integrating IT themes in postgraduate research; employer–provider collaboration	Hire foreign experts who mentor locals; co-create master’s programs; nationwide IT integration plan in curricula	Continuous upskilling, cybersecurity drills, company-wide training despite conflict

4.3. Hospitality Sector

4.3.1. Labor Shortages in the Hospitality Sector

Considering the labor market demand over the last five years, the hospitality sector is one of the most highly demanded in North Macedonia, Ethiopia, and Türkiye, but not in Ukraine. The companies surveyed were small and localized in the three countries, and nearly all of them stated that they had faced serious difficulties in finding skilled labor. A participant in Ethiopia identified the lack of skilled labor as the reason for this challenge, stating that

"It is difficult to find an employee suitable for your desired purpose without further training... There are many job seekers, but very few have the necessary skills. Forget about skills, some of them are not even trainable".

In North Macedonia, the hospitality sector shows relatively high vacancy rates, possibly due to turnover, seasonality, and persistent skill gaps. One respondent stated that

"The five qualifications in which there is a shortage. . . are waiters, cooks, pizza and pastry chefs, as well as receptionists".

Occupation-level data show the strongest demand growth for service and sales workers, who typically require moderate or intermediate qualifications.

Türkiye presents a similar situation to North Macedonia, with a labor shortage in the hospitality sector, particularly for positions requiring medium-level skills that do not require higher education. As one respondent noted, "We face difficulties in finding certain professions. The professions where we have trouble finding personnel are, in order, cooks and cleaners". The reasons for the labor shortage in the hospitality sector are attributed to a lack of applications, dissatisfaction with the work environment and labor conditions, lack of professional skills, and lack of experience (İŞKUR 2023). However, positions such as cleaning staff, restaurant service staff, baggage and valet services, receptionists, and cooks in the service sector are noted to be easier to fill, despite issues related to qualifications. This may be attributed to an oversupply of trained workers in these fields, combined with deficiencies in their training processes.

Under the theme of "Labor Shortage and Gender Inequality," shared opinions indicate that while no gender discrimination is applied in recruitment, gender inequality is more prevalent in blue-collar roles compared to white-collar roles. Some companies encourage female participation in technical roles, while others claim that a spontaneous and natural balance has emerged without specific interventions. One respondent commented on this issue as follows:

"We don't have gender discrimination, but certain jobs are more gender specific. For instance, in cleaning work, men tend to be less thorough, while women work with greater attention to detail and honesty. For this reason, we prefer women for cleaning jobs. In other roles, the gender of employees doesn't matter. We find that our female employees are much more successful than male employees".

In Türkiye and Macedonia, it was stated that women are preferred in certain areas due to their natural success, while in Ethiopia, this situation was described as a government policy. Positive gender representation is a government policy. However, the availability and interest of female candidates are important. For example, in training programs such as accounting, office management, ICT, and tourism and hotel management, you can find many female interns and trainers. However, it is difficult to find women in programs that focus on hard skills, such as those related to machinery, technological skills, and agriculture. For example, in our agricultural processing training program, the representation of female interns is less than 10%.

The inadequacy of the education system is emphasized by all respondents as a significant factor contributing to the lack of skilled labor. Company executives stated that education programs are heavily theoretical, disconnected from practical applications, and not aligned with the real needs of the business world, leading to a lack of quality in workforce training. A common issue mentioned is the lack of practical skills among graduates, combined with an overproduction of inadequately prepared graduates, which saturates the market with individuals lacking practical knowledge. One respondent noted that while the theory is sound, it is not readily applicable without hands-on experience, while others criticized the overproduction of ill-prepared staff. About 25% of respondents stressed

that slow curriculum updates hinder skill relevance. A minority (18%) of respondents from North Macedonia acknowledged recent improvements, such as the inclusion of data analytics and digital marketing, but still found the updates to be too slow.

Finally, the hospitality sector also has its specificities. Cooks, waiters, cleaners, and mid-level service managers are in perpetual demand. A Turkish firm noted that

> *"We face some difficulties in finding certain professions. . . The professions where we have trouble finding personnel are cooks and cleaners".*

This high turnover and pronounced seasonality is especially notable in North Macedonia and Türkiye. Some hotels and restaurants even partner with vocational education and training institutions or universities to train staff in-house. In Ethiopia, hotels and restaurants noted severe shortages of properly trained staff. As an Ethiopian hospitality firm noted:

> *"It is difficult to find an employee suitable for your desired purpose without further training. . . Some of them are not even trainable".*

On the other hand, Ukraine contrasts sharply with the other three countries, where hospitality remains one of the key employment sectors. This overall sector contraction is mostly due to the ongoing military aggression, since hospitality businesses are operating at a reduced capacity, with staff either displaced or enlisted.

4.3.2. The Pronounced Seasonality and Migration Within the Hospitality Sector

Emigration was seen as a serious threat by nearly three out of four respondents. In North Macedonia, where students tend to work seasonally in countries such as Croatia, this seasonal work affects their studies and leads to school dropouts. In Türkiye, where students and skilled workers go abroad for various reasons, brain drain was described by a respondent as "*not just a threat, but a massive one. Our workforce has completely fled abroad. They've gone to Canada, the U.S., and France, and because of this, we're experiencing labor shortages".* Similarly to Macedonia and Türkiye, it was stated that in Ethiopia, forced migrations due to natural disasters or voluntary migrations made by individuals seeking to improve their standards are seen as a threat. One participant described this situation as follows:

> *"Most of the workers are leaving local companies and migrating to Arab countries, as well as several countries in Asia and Europe. As the number of countries seeking labor from Africa increases, the challenge will continue and become stronger than the challenges we face today".*

Policymakers also supported this view. However, returned migrants are generally welcomed, as they are believed to bring valuable experience and skills acquired abroad, thus positively impacting domestic companies. While this view was supported by most companies in North Macedonia, companies interviewed in Türkiye did not report any returned migrants. In Ethiopia, it has been observed that most returning migrants prefer to start their own businesses, rather than seek employment.

4.3.3. Strategies to Address Shortages

Companies in North Macedonia and Ethiopia stated that they apply strategies to address skill shortages caused by migration and brain drain. These strategies include improving working conditions, investing in training, human resource strategies, and a holistic approach to employee satisfaction. In Türkiye, six respondents highlighted that no significant work had been carried out in this area, while others emphasized the need for high-quality education and resolution of employment issues. Based on the interviews conducted, companies were found to have addressed skill shortages by offering internships,

participating in dual education programs, and collaborating with educational institutions. One respondent from North Macedonia stated that

> *"We [the company] solve the problems with a lack of qualifications and skills by organizing internal training workshops, in cooperation with external experts".*

A respondent from Türkiye said,

> *"We assist universities by providing internship opportunities to students".*

However, companies acknowledge challenges such as limited student interest and outdated programs, stressing the need for more industry-driven reforms in education.

Regarding tools related to the visibility and transparency of degrees and competencies gained by students in national qualifications systems and abroad, nine institutions responded negatively, while others reported using tools such as Europass and ESCO, with one respondent stating that

> "*We provided Europass certificates to some of our students. For instance, we took students from food and beverage services to France*".

Hiring migrant workers is a rare issue in both countries. Only one company in Türkiye and two companies in North Macedonia stated that they had migrant workers to address skill shortages.

4.3.4. Issues and Country-Specific Aspects in Hospitality

Similarly to the previous two sections, the interview responses can be systematized to observe the country-specific issues that shape the labor market in the hospitality sector, which seems to be heavily impacted by labor shortages and seasonal migration (see Table 3). In hospitality and service, employers face significant difficulties in filling essential roles, such as cooks, waiters, cleaners, and receptionists, which are in constant demand. In North Macedonia and Türkiye, shortages are primarily driven by a high staff turnover, unattractive working conditions, and a persistent lack of practical skills among applicants. Ethiopia experiences a slightly more intense challenge, where employers report a widespread deficit in basic competencies, rendering many candidates as even "*not trainable*". On the other hand, in Ukraine, the war has severely disrupted this sector; with many workers displaced or conscripted, the overall demand for hospitality services has practically diminished, and remains limited even now.

Table 3. Hospitality sector workforce issues encountered by countries.

Theme	North Macedonia	Türkiye	Ethiopia	Ukraine
Hard-to-fill roles	Waiters, cooks, pastry chefs, receptionists	Cooks, cleaners, mid-level service staff	Cooks, waiters, cleaners	Staffing diminished; sector capacity reduced
Key shortage drivers	Seasonality, high turnover, low practical skills	Poor work conditions, skill gaps, low applications	Severe skills deficit; many applicants "not trainable"	War disruption; staff displaced or enlisted
Migration effects	Student and worker emigration to seasonal EU jobs	Brain drain to Canada/US/EU	Outflow to Gulf and Asia; internal displacement	Mass displacement—hospitality demand collapses
Gender dynamics	Women preferred in certain service roles	Women favored for cleaning; gender gaps in blue-collar jobs	Government policy for female inclusion, yet low in high-skill roles	n.a.
Employer responses	In-house workshops, VET partnerships, internships	Limited so far; some university internships	Improve conditions, staff training, dual education	Coping strategies limited by conflict

It is well understood that emigration further amplifies these challenges. For instance, Macedonian and Turkish workers often seek better seasonal or long-term employment in the EU, Canada, or the US, while Ethiopia sees considerable outflows to Gulf and Asian labor markets. This seasonality is notably pronounced during the summer period, with one of the key drivers being the wages offered. Moreover, it is worth noting that gender dynamics can vary in this sector. Women are often preferred in service and cleaning roles in North Macedonia and Türkiye, while Ethiopia emphasizes gender inclusion, even though it struggles with representation in skilled roles, as reported by crucial stakeholders. To tackle these challenges, Macedonian firms invest significantly in vocational partnerships and training initiatives, while Ethiopia has begun implementing dual education models and has focused more on improving work conditions. On the contrary, Türkiye's employer responses remain limited, while in Ukraine, these options are constrained by the ongoing conflict.

5. Discussion

Upon conducting the study, we found that all the analyzed countries, i.e., North Macedonia, Türkiye, Ukraine, and Ethiopia, reported notable skill shortages and challenges in their domestic labor markets, which were particularly emphasized for the manufacturing, ICT, and hospitality sectors. Even despite the different country-specific contexts, such as the war-driven disruptions in Ukraine, the internal conflicts in Ethiopia, the large influx of refugees in Türkiye, and the persistent emigration in North Macedonia, the existence of gaps between employers' demands and employees' relevant technical and soft skills seems to be a unifying theme.

5.1. Skill Mismatches Through a Comparative Lens

North Macedonia and Türkiye especially emphasize seasonality and frequent turnover as some of the main drivers of the aforementioned shortages. Mostly due to market saturation, in the ICT sector, there seems to be a large pool of entry- or mid-level IT specialists. Findings from all four countries seem to allude to a lack of advanced IT professionals for specific roles such as senior software developers or cybersecurity experts.

This pattern can be related to the broader observation that emerging markets tend to suffer from horizontal mismatches, where the workers do not possess the competence demanded by technologically complex tasks. Consistent with Becker's (2008) human capital framework, the private return on more complex technical skills increases faster than the general education, while in each of the four countries analyzed, it seems that there is under-investment in training capacities for such skills.

When discussing skill shortages and mismatches, we have to note the common characteristic across the four countries of migrant origin: the misalignment of education systems. In all four cases, interviewees pointed out outdated curricula in higher education. Outdated, highly theoretical education systems that are disconnected from the industry pose a significant challenge. Although the degree of the issue varies, industries in North Macedonia, Ethiopia, Türkiye, and Ukraine struggle to recruit employees with relevant skills because higher education and vocational education and training providers fall short in offering practical and timely training aligned with labor market demands. Consequently, there are instances when applicants with the required qualifications fail to meet the expected performance standards. This disconnection demotivates young people, which can lead to reduced school attendance and less meaningful engagement in learning in certain cases. For instance, in North Macedonia, about 82% of interviewed companies questioned the effectiveness of the education system, referring to a "*notable difference between business reality*

and theoretical knowledge". In Ethiopia, TVET graduates rarely receive authentic exposure to modern machinery. An Ethiopian manufacturing firm noted that

> *"University and TVET institutions are not getting opportunities for students to practice with technology and machines we use. . . As a result, it is hard to get graduates with relevant skills".*

5.2. Migration, Brain Drain, and Labor Mobility

Additionally, we found that country-specific demographic conditions and overall sectoral conditions can play a crucial role in determining skill shortages and mismatches. For instance, in North Macedonia, these issues are notably driven by relatively low wages and high emigration. In Türkiye, the large influx of Syrian refugees filling low-skilled or informal roles in manufacturing allows high-skilled workers to emigrate, thus contributing to brain drain. In Ethiopia, rapid industrialization intensifies the need for advanced technical skills. On the other hand, the conflict-triggered displacement of the Ukrainian workforce reshapes labor demand across different regions, which contributes to significant disparities. The lack of conducive working conditions to attract and retain a skilled workforce also seems to be a notable factor. Highly skilled workers tend to compare the work environment and salary scales across various companies and organizations. Consequently, many highly skilled employees from all four countries prefer to move to other European countries that offer better salaries and work conditions. While Türkiye and North Macedonia experience net brain drain, Ukraine and Ethiopia oscillate between loss and circular migration, suggesting that targeted reintegration incentives can partially offset human capital flight (see Dustmann et al. 2011).

Overall, it is well understood that emigration poses a serious challenge to the four economies, and can be viewed as a double-edged sword. However, the context is quite different. The most sought-after qualifications in North Macedonia, Ethiopia, Türkiye, and Ukraine, such as high-level IT professionals, healthcare providers, skilled machine operators, and teachers, are also in demand globally. Consequently, well-developed countries naturally attract and recruit these skilled graduates, which inevitably starves the local markets of essential talent in the four economies.

Labor market demands are shifting rapidly, with an increasing emphasis on high-tech skills. Industries are moving toward automation, advanced technology, and the use of artificial intelligence. However, acquiring these skills in a short period is challenging, as training providers cannot make changes overnight, nor can the industries themselves implement in-house training overnight. Moreover, resource and infrastructure constraints pose significant challenges. Delivering connected, practical, and industry-relevant training requires substantial resources. In contexts where well-developed industries are unavailable to co-host training programs, educational providers can struggle to offer the relevant training necessary to make their graduates competitive in the global market, which may be the case for the economies analyzed in our study. Except for Ukraine, the other three countries serve as temporary destinations for migrants, as their destinations are EU member countries, notably Central and Western Europe. However, language barriers, cultural differences, immigration bureaucracy, and limited opportunities for skill development hinder these countries from fully refining the talents and resources that immigrants bring with them.

5.3. Sector-Specific Drivers and Digital Transition

In all three sectors, there are some context-specific dynamics. In the information and communications sector, roles that require specialized ability (e.g., cybersecurity, artificial intelligence, and data science) remain mostly unfilled. In Ukraine, the brain drain of IT

workers is mostly due to the ongoing war. Firms report that the demand for blockchain developers, drone operators, and cybersecurity staff is growing. Türkiye is characterized by rapid digital transformation. Even with on-the-job and company-led academies emerging, many top IT specialists leave for higher-paying destinations. Similarly, in North Macedonia, the ICT sector is recognized as crucial. However, talent retention is especially challenging, due to the attraction of skilled software developers by EU countries. In Ethiopia, most companies can easily hire entry-level IT graduates, but require foreign experts for highly specialized tasks. Across the manufacturing and hospitality sectors, our findings seem to align well with the argument made by Autor (2015) that automation substitutes routine and mid-skill tasks, which, in turn, should raise demand for advanced roles and low-skill service roles—which we have undoubtedly observed. Thus, without complementary re-skilling and training, such polarization may widen existing wage gaps and fuel further migration.

5.4. Policy and Institutional Implications

A series of interconnected measures can be drawn to mitigate skill shortages, better align educational systems with labor market demands, and efficiently manage the rising complexities of migration. Systemic reforms are necessary to ensure greater resilience and inclusiveness in the labor markets of the four analyzed economies.

Moreover, Türkiye and North Macedonia should align their national qualifications frameworks (NQFs) with the European Union Qualifications Framework (EQF) to establish sustainable vocational and technical education models and policies, in order to ensure that the expectations of the sector are aligned with vocational and technical education, and to create incentivizing policies to provide vocational qualifications for both the inactive workforce and migrant workers within the scope of lifelong learning. Ukraine, on the other hand, can speed up the planned reforms to its qualification system, shifting away from an outdated and overly bureaucratic approach. Moreover, its plans for multiple consolidations of educational institutions according to the cluster principle and through the creation of corporate universities, hubs, and international centers may become quite useful in this context. Adopting a similar approach in Ethiopia and North Macedonia may improve the overall quality and reduce the duplication of necessary resources. Ethiopia should enhance its capacity to accredit technical and vocational education and training programs according to robust quality criteria, ensuring that graduates acquire employable competencies that match both domestic and global market needs.

Enhancing collaboration between the industry and the education sector seems to be a necessary approach. One of the main aspects of this collaboration is the co-creation and design of curricula and mandatory workplace training. North Macedonia could foster closer collaboration between employers and VET providers, encouraging dual education models and workplace apprenticeships. Türkiye can build on existing partnerships by strengthening sectoral advisory boards that shape curricula, particularly in manufacturing (textiles, garment, welding) and hospitality (tourism-oriented VET). On the other hand, Ethiopia should formalize the requirements for industries to co-host training programs. Having a policy that encourages mapping diasporas and leveraging their experiences and skills is essential. Over the past three decades, talented and skilled citizens have migrated to the West, where many have gained a wealth of expertise and experience. Establishing and maintaining connections with these individuals and their organizations can provide significant benefits to their home countries and respective training providers. It can be quite opportunistic to encourage short, targeted training in high-demand areas such as advanced IT, automated manufacturing, and specialized hospitality services. This seems to be especially important for North Macedonia and Ethiopia, where current workers need rapid training to align with modern industry needs.

Besides these policies, addressing wage disparities and labor standards is necessary to retain local talent and reduce brain drain. As noted, North Macedonia faces persistently low wages in manufacturing, driving high emigration. Introducing wage subsidies or boosting minimum wages in strategic sectors (e.g., advanced manufacturing, ICT) could prove to be effective in curbing skilled emigration. In Türkiye, low unionization exacerbates insecure working conditions and deters workers from certain sectors, like apparel and hospitality. Encouraging collective bargaining and ensuring compliance with labor standards can promote job stability and reduce turnover. However, Ukraine must introduce serious post-war investments to increase wages and ensure a stable social contribution system to prevent further brain drain. In addition, it can be noted that Türkiye and Ethiopia exhibit high levels of informality, particularly in manufacturing and hospitality. In this context, implementing targeted policies, such as tax incentives for formal hiring, and simplified registration procedures could narrow skills gaps by making these roles more attractive. However, legal controls remain crucial in ensuring efficient labor utilization.

Türkiye hosts the world's largest refugee population, but fails to fully capitalize on their skills, due to informality and insufficient recognition frameworks. Establishing clear procedures for skill accreditation, language training, and job matching would harness migrant potential, while also deterring exploitation. Expanding incentives for return migration, especially for high-skilled workers in ICT and manufacturing, should be one of the primary policies induced by Macedonian policy creators. Although its situation is slightly different to the other cases, Ukraine could design reintegration packages for wartime refugees, focusing on expedited credential recognition and job matching services in reconstruction-related industries. In this context, closer collaboration with regional and EU partners to adopt common standards in skill certification and mutual recognition may smooth temporary labor migration while mitigating the negative aspects of brain drain.

Finally, adopting robust labor market information systems is critical. Almost all economies lack an efficient system that tracks supply and demand for specific qualifications, which, in turn, could help HEIs and VET institutions to calibrate admissions and curricula. Designing such a system could be crucial for real-time tracking of vacancies in Ethiopia, Ukraine, and North Macedonia, while Türkiye should expand cooperation between government agencies and employers to refine labor market forecasting, particularly for medium-skill manufacturing and service roles.

5.5. Limitations and Future Work

This study relies on relatively small interview samples, and therefore cannot claim generalizability of the research. Even though the choice of stakeholders was not random, the idea was to find the most relevant companies and institutions based on their size and relatedness to the topic itself. While most of them were traced based on overall reputation in the given sector, a cold-calling method was also employed. The interview responses thus include a certain degree of subjectiveness of the respondent and their overall familiarity with the topic of migration, skill shortages, and mismatches. It should further be noted that the research is employer-centered, rather than employee-centered. Consequently, the findings do not represent employee viewpoints on working conditions, perceived barriers, and the effectiveness of formal education and training. Moreover, administrative vacancy data and VET statistics differ in taxonomy and reporting frequency across North Macedonia, Türkiye, Ethiopia, and Ukraine. Harmonizing such categories ex post risks misclassification of the obtained data (for instance, whether short-course certificates count as "tertiary" IT training). Since the initial interviews were conducted in the local language, comparability was ensured by translation to English, which may have introduced translation and interpretative bias. Finally, we note that the respondents

may have overstated recruitment difficulties to signal the importance of their sector, or understated retention problems to preserve their corporate image, which was especially evident when discussing gender-based barriers.

Future work should combine our qualitative insights with longitudinal administrative data, especially to quantify the causal impact of migration shocks on vacancy durations. Moreover, investigating the effectiveness of corporate-led micro-credentials could illuminate fast-track solutions to the advanced IT shortages noted across all four economies. In relation to this, observing employee perceptions on the topic and interviewing the migrant population could produce interesting insights that could create a bigger picture of how the complex interplay of shortages, mismatches, education, and migration impact labor market development and cross-border partnerships.

6. Conclusions

Anchored in three core research questions—i.e., (1) What are the sector-specific skill shortages and mismatches in the four countries? (2) How do different forms of migration increase or decrease those shortages and mismatches? (3) Which policy instruments hold the greatest promise for closing the widening labor market gaps emerging as a result of inadequate education and pronounced migration?—this study introduced a qualitative-driven mixed-methods design to propose an integrated answer to each question while accounting for country-specific nexuses.

This comparative study, conducted through interviews with companies, HEIs, VET institutions, policy creators, and intermediaries, reveals that skill shortages, mismatches, and migration flows intersect to shape the labor market dynamics in North Macedonia, Türkiye, Ukraine, and Ethiopia, even despite the very different socio-political contexts. Regarding the first research question, the evidence demonstrates that the labor markets in all four countries face acute shortages in advanced machine operation skills, senior ICT roles (such as cybersecurity, data science, AI), and key hospitality occupations (cooks, waiters, receptionists), even though they have different intensity profiles shaped by conflict, informality, and even industrial upgrading in each country. In each case, the root causes of these labor market pressures emerge from a misalignment between educational systems and the evolving needs of employers, as well as from inadequate policy frameworks that consistently fail to retain skilled workers. Outdated curricula and theoretical, rather than practical, training have been highlighted as some of the main contributors to skill shortages, particularly in the manufacturing, ICT, and hospitality sectors. Meanwhile, low wages and constrained working conditions have further fueled emigration.

Additionally, country-specific factors can magnify these challenges further. Regarding the second research question, our cross-country research shows that migration can act as both a safety net and a stress multiplier. For example, Ukraine provides the clearest illustration of how forced displacement and mobilization have simultaneously collapsed hospitality demand, redirected manufacturing to defense production and the Western part of the country, and spurred a global hunt for Ukrainian IT specialists. In Türkiye, large-scale refugee inflows (mainly from Syria) partially ease low-skilled employee shortages, but push many mid-skill occupations into further informality. The low wages in North Macedonia encourage the emigration of qualified personnel, while Ethiopia's ambitious industrialization efforts highlight an underprepared workforce in several key areas. Even despite these differences, a unifying theme across all four economies is the urgent need for policies that harmonize qualification frameworks, improve collaboration between industry and academia, and address wage competitiveness to retain invaluable human capital. Finally, investigation on the topic of the third research question showed that the most notable actions undertaken in the four economies are the co-development of competence-based cur-

ricula with industry partners, wage and career advancement incentives to make domestic employment more attractive compared to emigration, and streamlined qualification recognition systems for both immigrants and returning emigrants, although this was employed in fewer cases.

Thus, policy initiatives must be holistic and multidimensional. Upgrading vocational curricula through closer engagement with employers is essential for producing graduates who possess the practical skills demanded in both domestic and global markets. Mechanisms for recognizing and integrating migrant skills should be simplified, preventing the underutilization of qualified individuals, most notably in Türkiye. Comprehensive labor market information systems can also guide timely interventions, while targeted public–private partnerships can improve both the quality and the accessibility of training programs. Finally, efforts to encourage diaspora engagement in North Macedonia and Ethiopia could encourage further transfers of knowledge and stimulate entrepreneurship, mitigating the negative impacts of brain drain.

At last, the complexity and interdependence of skill shortages, mismatches, and migration require policy responses that transcend traditional sectoral or national boundaries. By drawing on the unique empirical evidence from the four diverse countries, this study highlights the significance of adaptive education systems, competitive labor standards, and inclusive migration strategies. Encouraging sustainable collaboration among governments, educational institutions, employers, and international stakeholders will not only address immediate workforce gaps, but also bolster longer-term resilience in each of these economies.

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Abbreviations

The following abbreviations are used in this manuscript:

ICT	Information and communication technology
HEI	Higher education institution
VET	Vocational education and training
EU	European Union
NQF	National qualifications framework
EQF	European Qualifications Framework

References

African Development Bank. 2020. *Vocational Qualifications and Sectoral Growth in Africa*. Abidjan: Ivory Coast.

Akin, Mustafa S., and Emre Karadas. 2023. Reasons behind the migration of highly qualified employees from Türkiye: The case of software developers and engineers. *Journal of Economy, Culture and Society* 68: 97–110. [CrossRef]

Aluttis, Christoph, Tewabech Bishaw, and Martina W. Frank. 2014. The Workforce for Health in a Globalized Context–Global Shortages and International Migration. *Global Health Action* 7: 23611. [CrossRef] [PubMed]

Autor, David H. 2015. Why Are There Still So Many Jobs? The History and Future of Workplace Automation. *Journal of Economic Perspectives* 29: 3–30. [CrossRef]

Bartlett, Lesley, and Frances Vavrus. 2017. Comparative Case Studies: An Innovative Approach. *Nordic Journal of Comparative and International Education (NJCIE)* 1: 5–17. [CrossRef]

Becker, Gary S. 2008. *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*, 3rd ed. Chicago: The University of Chicago Press.

Braun, Virginia, and Victoria Clarke. 2006. Using Thematic Analysis in Psychology. *Qualitative Research in Psychology* 3: 77–101. [CrossRef]

Cappelli, Peter. 2015. Skill Gaps, Skill Shortages, and Skill Mismatches Evidence and Arguments for the United States. *Industrial and Labor Relations Review* 68: 251–90. [CrossRef]

Cedefop. 2015. *Skills, Qualifications and Jobs in the EU: The Making of a Perfect Match?: Evidence from Cedefop's European Skills and Jobs Survey*. Luxembourg: Publications Office. Available online: https://data.europa.eu/doi/10.2801/606129 (accessed on 20 January 2025).

Cedefop. 2023. *European Guidelines for Validating Non-Formal and Informal Learning (Cedefop Reference Series No. 124)*. Luxembourg: Publications Office. [CrossRef]

Chen, Fanyu, Zi Wen Diana Wong, and Siong Hook Law. 2024. Brain Drain: What Is the Role of Institutions? *Journal of Industrial and Business Economics* 51: 605–628. [CrossRef]

Creswell, John W., and Vicki L. Plano Clark. 2018. *Designing and Conducting Mixed Methods Research*, 3rd ed. Los Angeles: SAGE.

Deimantas, Vaclovas Jonas, and A. E. Şanlıtürk. 2023. *Refugees from Ukraine in Lithuania and the Lithuanian Labour Market: A Preliminary Assessment*. Geneva: International Organization for Migration. Available online: https://publications.iom.int/system/files/pdf/PUB2023-030-R-MSR76.pdf (accessed on 20 January 2025).

Desjardins, Richard, and Kjell Rubenson. 2011. *An Analysis of Skill Mismatch Using Direct Measures of Skills*. OECD Education Working Papers, No. 63. Paris: OECD Publishing. [CrossRef]

DİSK. 2019. *Türkiye'de sendikalaşma, toplu iş sözleşmesi kapsamı ve grevler (2013–2019)*. Available online: https://disk.org.tr/wp-content/uploads/2019/02/Sendikalasma-Arastirmasi.pdf (accessed on 20 January 2025).

Donat, İrfan. 2024. Tarım 2023'te yüzde 0.2 küçüldü. *Bloomberg HT*, December 7. Available online: https://www.bloomberght.com/tarim-2023-te-yuzde-0-2-kuculdu-2348434 (accessed on 7 December 2024).

Dustmann, Christian, Itzhak Fadlon, and Yoram Weiss. 2011. Return Migration, Human Capital Accumulation and the Brain Drain. *Journal of Development Economics* 95: 58–67. [CrossRef]

Duszczyk, Maciej, and Paweł Kaczmarczyk. 2022. War and Migration: The Recent Influx from Ukraine into Poland and Possible Scenarios for the Future. Available online: https://www.migracje.uw.edu.pl/wp-content/uploads/2022/04/Spotlight-APRIL-2022.pdf (accessed on 20 January 2025).

Ege, Abdullah A., and Ece A. Erdil. 2023. Review of Empirical Research on Vertical Mismatch and Field of Study Mismatch in Türkiye and Additional Evidence from Their Overlapping Mismatch. Available online: https://dergipark.org.tr/en/pub/ausbf/issue/81654/1161828 (accessed on 20 January 2025).

Employment Service Agency. 2023. *A Survey on the Need for Skills in the Labor Market in the Republic of North Macedonia for 2023*. Skopje: Employment Service Agency. (In Macedonian)

Ethiopian Statistical Service. 2021. Labour and Migration Survey Key Findings. Available online: https://www.ena.et/web/eng/w/en_27505#:~:text=the%20survey%20found%20that%2017.1,disappeared%20and%2013%20percent%20died (accessed on 20 January 2025).

European Commission. 2024. Commission Staff Working Document: Ukraine 2024 Report. Available online: https://neighbourhood-enlargement.ec.europa.eu/document/download/1924a044-b30f-48a2-99c1-50edeac14da1_en (accessed on 20 January 2025).

European Training Foundation. 2017. Skill Mismatch Measurement in North Macedonia. Available online: https://www.etf.europa.eu/sites/default/files/2019-07/Skills%20mismatch%20measurement_North%20Macedonia.pdf (accessed on 20 January 2025).

European Training Foundation. 2021. How Migration, Human Capital and the Labour Market Interact in North Macedonia. Available online: https://www.etf.europa.eu/sites/default/files/2021-05/migration_north_macedonia.pdf (accessed on 20 January 2025).

European Union. 2024. North Macedonia 2024 Report. Available online: https://neighbourhood-enlargement.ec.europa.eu/document/download/5f0c9185-ce46-46fc-bf44-82318ab47e88_en (accessed on 20 January 2025).

Ghazali, Mohd Safwan, Muhammad Adidinizar Zia Ahmad Kusairee, Peck Leong Tan, Nurul Hafizah Mohd Yasin, and Mohd Rushdan Yasoa. 2015. Intention to Migrate: Underlying Factors Affecting Malaysia Brain Drain. Paper presented at the 4th International Seminar on Entrepreneurship and Business (ISEB2015), Faculty of Entrepreneurship and Business, Penang, Malaysia, October 17; Edited by Mohd Rosli bin Mohamad, Mohammad bin Ismail, Mohd Rushdan Yasoa', Mohd Asrul Hery Ibrahim and Zulkarami Che Musa. Bachok, Kelantan: Universiti Malaysia Kelantan, pp. 636–46.

Gökbayrak, Şölen, and Y. Cengiz Çalışır. 2024. Geleceğin istihdam gereksinimlerine uyumlu nitelikli işgücü ihtiyacı ve beceri geliştirme modelleri–Future Employment Requirements and Models for Developing Vocational Skills/Qualifications. Available online: https://dergipark.org.tr/en/pub/sobild/issue/86492/1485349 (accessed on 20 January 2025).

Gulek, Ahmet. 2024. Formal Effects of Informal Labour: Evidence from the Syrian Refugees in Türkiye. Available online: https://economics.mit.edu/sites/default/files/inline-files/Formal_Effects_of_Informal_Labor_Paper_final_1.pdf (accessed on 20 January 2025).

Hrynkevych, Oksana, Oksana Levytska, and Iryna Baranyak. 2023. Human resources for regional development in Ukraine: A roadmap for forecasting and determining a regional training request. *Regional Science Policy & Practice* 15: 95–108. [CrossRef]

International Labour Organization (ILO). 2021. *World Employment and Social Outlook: Trends 2021 (ISBN 978-92-2-031959-8)*. Geneva: International Labour Office.

International Labour Organization (ILO). 2022. The Impact of the Ukraine Crisis on the World of Work: Initial Assessments. Available online: https://www.ilo.org/sites/default/files/wcmsp5/groups/public/---europe/---ro-geneva/documents/briefingnote/wcms_844295.pdf (accessed on 20 January 2025).

International Labour Organization (ILO). 2023. Access to Labour Markets and Employment in Europe for Refugees from Ukraine. Available online: https://dtm.iom.int/dtm_download_track/35781?file=1&type=node&id=25491 (accessed on 20 January 2025).

IOM Türkiye. 2025. "Türkiye'de Göç". Available online: https://turkiye.iom.int/tr/turkiyede-goc#:~:text=T%C3%BCrkiye%E2%80%99de%20ikamet%20eden%20g%C3%B6%C3%A7men,%C3%A7at%C4%B1%C5%9Fmalar%20sonucunda%20T%C3%BCrkiye%E2%80%99ye%20gelmi%C5%9Ftir (accessed on 14 April 2025).

İŞKUR. 2023. Labour Market Research. Available online: https://media.iskur.gov.tr/95888/turkiye.pdf (accessed on 20 September 2024).

Kavak, İbrahim. 2023. Aşırı eğitimlilik olgusu ve işgücü piyasasına etkileri. Available online: https://media.iskur.gov.tr/91599/ibrahim-kavak.pdf (accessed on 20 January 2025).

Kerr, Sari Pekkala, William R. Kerr, Caglar Ozden, and Christopher A. Parsons. 2016. *Global Talent Flows*. CESifo Working Paper 6203. Munich: Center for Economic Studies and ifo Institute (CESifo). Available online: https://www.econstor.eu/bitstream/10419/149290/1/cesifo1_wp6203.pdf (accessed on 20 January 2025).

Korstjens, Irene, and Albine Moser. 2017. Series: Practical Guidance to Qualitative Research. Part 2: Context, Research Questions and Designs. *European Journal of General Practice* 23: 274–79. [CrossRef] [PubMed]

Kölling, Arndt. 2022. Shortage of skilled labor, unions and the wage premium: A regression analysis with establishment panel data for Germany. *Journal of Labor Research* 43: 239–59. [CrossRef] [PubMed]

Lim, Zhi Ying, Jia Hao Yap, Jia Wen Lai, Ima Asrina Mokhtar, Daniel Jin Yeo, and Khim Huat Cheong. 2024. Advancing lifelong learning in the digital age: A narrative review of Singapore's SkillsFuture programme. *Social Sciences* 13: 73. [CrossRef]

Marchiori, Luca, I-Ling Shen, and Frédéric Docquier. 2013. Brain Drain in Globalization: A General Equilibrium Analysis from the Sending Countries' Perspective. *Economic Inquiry* 51: 1582–1602. [CrossRef]

McGuinness, Seamus, Konstantinos Pouliakas, and Paul Redmond. 2018. Skills mismatch: Concepts, measurement and policy approaches. *Journal of Economic Surveys* 32: 985–1015. [CrossRef]

McGuinness, Seamus, Kostas Pouliakas, and Paul Redmond. 2017. *How Useful Is the Concept of Skills Mismatch?* (IZA Discussion Paper No. 10786). Bonn: Institute of Labor Economics (IZA).

Miles, Matthew B., A. Michael Huberman, and Johnny Saldaña. 2014. Designing Matrix and Network Displays. In *Qualitative Data Analysis: A Methods Sourcebook*, 3rd ed. Los Angeles: SAGE, pp. 106–15.

Ministry of Commerce. 2024. Economic Overview 2024. August. Available online: https://ticaret.gov.tr/data/5e18288613b8761dccd355ce/Ekonomik%20G%C3%B6r%C3%BCn%C3%BCm%202024%20A%C4%9Fustos.pdf (accessed on 20 January 2025).

Ministry of Labour and Social Policy. 2021. *National Employment Strategy 2021–2027 with an Action Plan of Employment 2021–2023*. Skopje: Ministry of Labour and Social Policy. (In Macedonian)

Ministry of Labour and Social Security. 2023. *Work Permit Statistics–2023*. Ankara: T.C. Çalışma ve Sosyal Güvenlik Bakanlığı.

Mojsoska-Blazevski, Nikica. 2017. *Tracing Secondary Vocational and Tertiary Education Graduates in the Former Yugoslav Republic of Macedonia: 2016 Tracer Study Results*. Torino: European Training Foundation. Available online: https://www.etf.europa.eu/sites/default/files/m/370594378AEE2242C12581C90068FE63_2016%20Tracer%20study%20results%20MK.pdf (accessed on 20 January 2025).

Onozuka, Yosuke. 2022. Basic skills or major-specific knowledge? Sources of wage penalties for working outside the major field of study. *Journal of Labor Research* 43: 24–64. [CrossRef]

Organisation for Economic Co-Operation and Development (OECD). 2022. Labour Migration in the Western Balkans: Mapping Patterns, Addressing Challenges and Reaping Benefits. Available online: https://www.oecd.org/content/dam/oecd/en/about/programmes/grc/grc-see/Labour-Migration-report.pdf (accessed on 20 January 2025).

Organisation for Economic Co-Operation and Development (OECD). 2023. *OECD Economic Surveys: Türkiye 2023*. Paris: OECD Publishing. [CrossRef]

Patton, Michael Quinn. 2015. *Qualitative Research & Evaluation Methods: Integrating Theory and Practice*, 4th ed. Thousand Oaks: SAGE Publications, Inc.

Pham, Thuc, Oleksandr Talavera, and Zhiyong Wu. 2023. Labor Markets During War Time: Evidence from Online Job Advertisements. Available online: https://voxukraine.org/en/labor-markets-during-war-time-evidence-from-online-job-advertisements (accessed on 20 January 2025).

Pinedo Caro, Laura. 2020. Syrian refugees in the Turkish labour market: A socio-economic analysis. *Sosyoekonomi* 28: 51–74. [CrossRef]

Pires, Armando J. Garcia. 2015. Brain drain and brain waste. *Journal of Economic Development* 40: 1–34. [CrossRef]

Radovan, Milan. 2024. Workplace flexibility and participation in adult learning. *Sustainability* 16: 5950. [CrossRef]

Schewel, Kerilyn, and Sonja Fransen. 2018. Formal Education and Migration Aspirations in Ethiopia. *Population and Development Review* 44: 555–87. [CrossRef] [PubMed]

Schioppa, Fiorella Padoa. 1991. Mismatch and Labour Mobility. In *Research Papers in Economics*. Cambridge: Cambridge University Press. Available online: https://econpapers.repec.org/bookchap/cupcbooks/9780521402439.htm (accessed on 20 January 2025).

Schnitzer, Martin. 2023. Why the West Needs Ukraine and Its IT Business. Available online: https://cepr.org/voxeu/columns/why-west-needs-ukraine-and-its-it-business (accessed on 20 January 2025).

State Audit Office of the Republic of North Macedonia. 2024. Performance Audit Report on the Topic of the Effectiveness of Measures to Prevent the Drain of Higher Education and Professional Personnel. Available online: https://dzr.mk/sites/default/files/2024-07/eng_DZR_Godisen_Izvestaj_facing_2023%20(1).pdf (accessed on 20 January 2025).

State Employment Service. 2024. Demand and Supply on the Registered Labor Market in 2024. Available online: https://old.dcz.gov.ua/sites/default/files/infofiles/popyt_i_propozyciya_na_rynku_praci_12_2023.pdf (accessed on 20 January 2025). (In Ukrainian)

TEPAV–Türkiye Ekonomi Politikaları Araştırma Vakfı. 2023. Sustainable Workforce Recovery in the Earthquake Region: Needs and Opportunities Field Survey and Results by TEPAV. Available online: https://tepav.s3.eu-west-1.amazonaws.com/upload/files/1689739141-2.Sustainable_Workforce_Recovery_in_the_Earthquake_Region_Needs_and_Opportunities.pdf (accessed on 20 January 2025).

Tikkanen, Tarja. 2014. Lifelong learning and skills development in the context of innovation performance. In *Learning across Generations in Europe. Research on the Education and Learning of Adults*. Edited by Bettina Schmidt-Hertha, Sabina Jelenc Krašovec and Marvin Formosa. Rotterdam: SensePublishers, pp. 101–12. [CrossRef]

TURKSTAT. 2023. Göç İstatistikleri. Available online: https://data.tuik.gov.tr/Bulten/Index?p=Ic-Goc-Istatistikleri-2023 (accessed on 14 April 2025).

TürkStat. 2024. Brain Drain Statistics, 2023. Available online: https://data.tuik.gov.tr/Bulten/Index?p=Yuksekogretim-Beyin-Gocu-Istatistikleri-2021-2023-53839 (accessed on 20 January 2025).

World Bank. 2021a. *Ethiopia's Economic Restructuring and Skill Demand*. Washington, DC: World Bank.

World Bank. 2021b. *World Development Report 2021: Data for Better Lives*. Washington, DC: World Bank.

World Bank. 2024. Country Overview–Ethiopia. Available online: https://www.worldbank.org/en/country/ethiopia/overview (accessed on 20 January 2025).

Yin, Robert K. 2018. *Case Study Research and Applications: Design and Methods*, 6th ed. Los Angeles: SAGE.