Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Towards Evidence-Based Migration Governance: A Novel Fuzzy Multi-Criteria Approach to Problem Prioritization

Harun Çetinkaya
Istanbul Medipol University
Serkan Eti
Istanbul Medipol University
Serhat Yüksel
serhatyuksel@medipol.edu.tr

Istanbul Medipol University
Hasan Dinçer
Istanbul Medipol University
Faik Tanrıkulu
Istanbul Medipol University
Enes Olgun
Istanbul Medipol University

Research Article

Keywords: Migration governance, Fuzzy multi-criteria decision making, Migrant integration problems, Labor market inequality, Policy prioritization

Posted Date: March 5th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-8865185/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Version of Record: A version of this preprint was published at Journal of International Migration and Integration on April 10th, 2026. See the published version at https://doi.org/10.1007/s12134-026-01388-9.

Towards Evidence-Based Migration Governance: A Novel Fuzzy Multi-Criteria Approach to Problem Prioritization

Abstract

Migration has become a multidimensional policy challenge for host countries, as migrants face economic, social, political, and psychological problems that hinder both their well-being and their potential contribution to social and economic development. A fundamental problem in this context is the absence of a clear prioritization of these diverse challenges, which limits the effectiveness of policy interventions. Although the literature extensively examines individual migrant related problems, comparative analyses that determine which problems are the most critical remain limited, creating an important gap in migration research. The aim of this study is to address this gap by identifying and prioritizing the most critical problems experienced by migrants in host countries through a comprehensive analytical framework. To this end, a novel fuzzy multi criteria decision making model is proposed, integrating a distance-based experts' weighting approach, the author developed COWEB technique for criteria weighting, and behavioral leadership fuzzy sets to capture expert heterogeneity and judgment behavior. The model evaluates fourteen problem criteria based on assessments from ten experts. The findings reveal that wage inequality and underemployment are the most critical challenges, highlighting the central role of labor market dynamics in migrant vulnerability. The results are validated through comparative analysis, correlation tests, and scenario-based robustness checks. The study contributes to the literature by offering an original and robust prioritization framework and addressing a key methodological gap. From a policy perspective, the findings suggest that strategies focusing on fair wage enforcement, skill recognition, and inclusive labor market policies are essential for effective migration governance.

Keywords: Migration governance; Fuzzy multi-criteria decision making; Migrant integration problems; Labor market inequality; Policy prioritization

1. Introduction

Migrants often face multiple and interconnected challenges in host countries, particularly in the economic and political spheres, which shape their overall integration experience. One of the most common economic problems is the limited availability of stable employment opportunities, as migrants frequently encounter structural barriers when entering the labor market. Even when employment is secured, many migrants experience underemployment, meaning they are compelled to work in low paid or low skilled jobs that do not correspond to their education, professional background, or qualifications (Westbrook, 2023). This situation is often accompanied by wage inequality, where migrants receive lower wages than native workers for similar tasks, reinforcing economic vulnerability. In addition, restrictions related to economic mobility further constrain migrants, as opportunities for career advancement remain limited due to difficulties in obtaining professional licenses or having foreign diplomas formally recognized. These conditions contribute to a broader process of precarization, characterized by insecure and unstable jobs, limited social protection, and a persistent lack of job security. Alongside economic challenges, political problems also play a significant role in shaping migrant experiences (Lechner-Meichsner et al., 2024). Migrants often struggle with limited political participation due to insufficient information about political systems, low awareness of their rights, and a lack of effective political representation. As a result, collective political action tends to remain weak. Moreover, discriminatory state policies based on national origin or migration status can restrict access to fundamental resources, legal protection, and citizenship rights, deepening social and political exclusion.

Migrants also encounter a range of social and psychological problems in host societies, which significantly affect their well-being and sense of belonging. Socially, many migrants experience loneliness and social isolation, as language barriers limit everyday communication and cultural differences make it difficult to establish meaningful social relationships. These challenges often lead migrants to feel like outsiders within the host community. In addition, experiences of discrimination are common, as the migrant label can result in stigmatization and marginalization in social life, workplaces, and public spaces. Access to social services also remains a major issue, since migrants may face obstacles in reaching healthcare, education, housing, and other basic services, often due to bureaucratic barriers or a lack of information about available resources (Henríquez et al., 2024). Legal status related problems further deepen social vulnerability, especially for undocumented migrants who live with constant uncertainty regarding their future. Lengthy asylum procedures and complex or punitive legal frameworks increase feelings of insecurity and exclusion. Alongside these social difficulties, psychological problems frequently emerge throughout the migration process. Many migrants are exposed to trauma before, during, or after migration, which raises the risk of post-traumatic stress disorder, anxiety, and depression (Fadhlia et al., 2025). The process of adapting to a new culture can also generate acculturation related stress, leading to feelings of alienation and identity conflict. Moreover, the persistent fear of deportation among undocumented migrants creates chronic stress and discourages them from seeking healthcare, reporting crimes, or engaging with local institutions, further intensifying psychological distress.

For a country to manage migration effectively, it is essential to first identify the most critical problems faced by migrants within the host society. Without a clear understanding of these key challenges, policy responses tend to remain fragmented and inefficient. If migrants are expected to contribute positively to the social and economic development of the host country, the

problems that limit their participation must be addressed in a timely and targeted manner. Otherwise, delays in problem solving can intensify existing vulnerabilities and lead to wider social, economic, and institutional difficulties (Tomren & Opaas, 2024). For this reason, the prioritization of migrant related problems becomes a crucial step in the policy making process. However, the existing literature provides only limited insight into which problems should be considered the most urgent. While there are many studies that focus on specific issues such as employment, legal status, social exclusion, or mental health, these problems are usually examined in isolation. Comparative analyses that systematically evaluate and rank different types of migrant problems remain relatively rare. This lack of integrative and comparative research represents an important missing gap in the migration literature (Madsen et al., 2025). As a result, policymakers often lack a clear framework for allocating resources and designing effective interventions. Addressing this gap requires the development of a new priority analysis that can identify the most critical challenges in a structured and evidence-based manner, thereby supporting more effective and sustainable migration governance.

The main objective of this study is to identify the most critical problems experienced by migrants in host countries in a systematic and prioritized manner. The motivation of the study stems from the lack of comprehensive analytical frameworks in the migration literature that can evaluate diverse problem types simultaneously and determine their relative importance. To address this limitation, the study proposes an integrated fuzzy multi criteria decision making model that captures both expert judgment and uncertainty inherent in social phenomena. Within this framework, opinions are collected from ten experts for fourteen distinct criteria representing key problem dimensions faced by migrants. To reflect differences in expert reliability and perspective, expert importance weights are determined by using a distance-based experts' weighting approach. The weighting of criteria is conducted through the COWEB technique, which is originally developed by the authors to enhance robustness and objectivity in criteria evaluation. In addition, behavioral leadership fuzzy sets are incorporated into the proposed model to better reflect human judgment behavior and cognitive diversity during the decision-making process. Through this methodological structure, the study seeks to answer several research questions. The first research question (1) focuses on identifying which migrant related problems are the most critical from an expert based comparative perspective. The second research question (2) examines how expert heterogeneity, and behavioral factors influence the prioritization results. By addressing these questions, the study aims to contribute a novel analytical tool to migration research and support evidence-based policy development.

This study contributes to the migration literature by introducing a novel fuzzy multi criteria decision making framework that enables a comparative and prioritized evaluation of migrant related problems. In doing so, it addresses an important methodological gap by integrating expert weighting, behavioral fuzzy sets, and an original criteria weighting technique to support more structured and evidence-based policy analysis. The proposed model demonstrates several important advantages over previously developed decision-making frameworks in the literature. The first advantage (1) lies in the originality of the COWEB technique, which is developed by the authors and introduces a distinctive perspective to criteria weighting. Unlike conventional approaches that rely on pairwise comparisons or aggregated judgments, COWEB initially identifies the best performing criterion and then determines the relative importance weights of the remaining criteria with reference to this benchmark. This structure allows the weighting process to be completed in a more efficient and coherent manner, while also reducing computational complexity and improving decision clarity. The second advantage (2) is the

development and integration of behavioral leadership fuzzy sets, which represents a significant methodological contribution. Compared to traditional fuzzy sets, intuitionistic fuzzy sets, or Fermatean fuzzy sets that primarily model uncertainty and hesitation, behavioral leadership fuzzy sets enable the analysis of expert evaluations based on leadership characteristics such as authoritative or innovative tendencies. For example, expert opinions reflecting high decisiveness or openness to change can be differentiated and interpreted more systematically. This capability helps to minimize the subjectivity problem that is frequently criticized in expert-based decision-making models. The third advantage (3) is related to the comprehensive structure of the criteria set, which simultaneously incorporates social, economic, political, and psychological dimensions of migrant related problems. Previous studies rarely adopt such a holistic perspective, and this multidimensional integration allows the proposed model to produce more comprehensive and policy relevant results, thereby strengthening its overall analytical superiority.

The remainder of this study is structured as follows. The theoretical framework section reviews the relevant literature and conceptual background related to migration problems and decision-making approaches. The proposed methodology section introduces the analytical framework of the study and explains the structure of the developed fuzzy multi criteria decision making model in detail. The analysis results section presents the empirical findings obtained from the application of the proposed model. The discussion section interprets these results in relation to existing studies and highlights their theoretical and practical implications. Finally, the conclusion section summarizes the main findings of the study and offers policy recommendations as well as suggestions for future research.

2. Literature Review

The economic difficulties experienced by immigrants in their host countries are considered one of the most fundamental factors shaping the immigrant experience (Sedacca, 2024). One of the main challenges faced by immigrants, especially in the early stages of arrival in the host country, is referred to in the literature as underemployment. This situation means that immigrants are unable to access employment opportunities appropriate to their skill levels in the labor market because their professional qualifications are not recognized by the host country (Buzarov, 2023). Consequently, immigrants are forced to work in jobs far below their educational level and in low wages. In addition to loss of qualifications and professional regression, wage inequality is seen as one of the fundamental problems that exacerbate immigrants' economic disadvantages (Banerjee et al., 2024). The literature reveals that immigrants are often employed in low-paying and highly precarious jobs (Mahmud and Soriano-Miras, 2025). Furthermore, occupational equivalence and licensing processes are among the barriers that limit immigrants' access to economic advancement and professional development opportunities (Lazarova et al., 2025). Aigner et al. (2025) found that refugees are moving away from their pre-migration fields of expertise, shifting to sectors with lower skill requirements, and are unable to find employment in positions appropriate to their skill levels. Gheorghiev (2025) reveals that there is a significant qualifications mismatch between migrant women's previous professional qualifications and the types of employment they have access to in the host country, preventing them from entering the labor market in their fields of expertise. Han and Hermansen (2024) emphasize that wage gaps largely arise from the systematic steering of migrants toward lower-paying jobs, and that these steering practices reproduce economic inequality through discriminatory division of labor and sorting mechanisms. Similarly,

Hermansen et al. (2025) emphasize that even when controlling for basic demographic factors, migrants earn an average of 17.9% less annually, an indicator of a systematically structured labor market that disadvantages migrants. Ghadi et al. (2023) stated that despite being educated, immigrants struggle to find jobs that match their qualifications. Foreign diplomas are systematically devalued, leading to widespread overeducated/under-skilled job combinations. Amin (2024) emphasized that the lack of recognition of foreign diplomas, language and accent discrimination, and ageism combine to push older immigrants into low-paying, underqualified jobs.

Another significant problem faced by immigrants in host countries is limited participation in political processes and access to rights (Iqbal et al., 2024). Immigrants' participation in political processes is weakened by the limited democratic experiences they acquired in different political and cultural environments prior to migration. First-generation immigrants face a lack of familiarity with democratic institutions and difficulties accessing information about electoral and representation mechanisms. This increases unfamiliarity with the workings of the political system and reduces their participation in processes such as voting, running for office, and political organizing (Tardivo, 2025). Another significant problem faced by immigrants in political processes is the lack of representation. This representation gap in the political arena indicates a significant inequality in immigrants' participation in decision-making processes. This also leads to a lack of political actors capable of defending immigrants' collective interests (Soare and Gherghina, 2024). Mohammed (2024) emphasized that integration policies and legal barriers are decisive in pushing Syrian refugees into the informal labor market in Turkey. Tariq et al. (2024) also argue that one of the most critical obstacles faced by migrants is the lack of policies themselves, and that the absence of clear and inclusive policies leads to persistent restrictions on refugees' autonomy and job choice. Gaweł et al. (2025) demonstrate that restrictive integration policies also negatively impact migrant entrepreneurship, with refugee entrepreneurs facing legal and administrative hurdles, in addition to difficulties accessing financial capital and market barriers. Furthermore, anti-migrant rhetoric from political actors and the resulting rise in far-right voting can directly influence migrants' spatial settlement decisions. Buch et al. (2025) found that labor migration is significantly lower in regions with high xenophobic attitudes, and that a 1% increase in far-right party voting reduces the migration rate. They also show that migrants avoid regions with potentially more hostile political climates.

Another significant problem experienced by immigrants in their daily lives is social problems (Chen, 2024). Loneliness and social isolation are prominent social problems in immigrants' daily life experiences. Ethnic minority groups are recognized as being more vulnerable to structural exclusion and social isolation during their social integration processes. This leads to a much higher level of loneliness, particularly for new immigrants, refugees, and asylum seekers (Cotterell et al., 2025). Racism deepens social isolation by undermining immigrants' ability to both bridge the gap with mainstream society and bond within their own ethnic communities (Zhang et al., 2024). Similarly, experiences of discrimination are another critical factor negatively impacting immigrants' social adaptation. Madsen et al. (2025) show that Arab male immigrants in Australia experience profound loneliness and social isolation due to the loss of community-centered social structures in their countries of origin. Language difficulties make social connection even more difficult, increasing the risk of depression and anxiety. Joshi et al. (2025) emphasize that ethnic minority groups in the United Kingdom are at high risk of loneliness, particularly due to racism and structural barriers. Khor et al. (2024) report that all immigrant nursing assistants in Norway face mistreatment and discrimination in the workplace

from both patients and colleagues. Henríquez et al. (2024) demonstrate that the discrimination immigrant children perceive in the school environment exacerbates peer problems, reduces social integration and competence levels, and increases the risk of suicidal ideation. Difficulties accessing social services also reinforce the vulnerability of immigrants. Ramos-Roure et al. (2024) emphasize that language barriers, particularly for newly arrived immigrants, hinder access to healthcare. Westbrook (2023) finds that undocumented immigrant families have been largely unable to access government financial support during the pandemic. A significant portion of the study participants appear to have avoided seeking social services due to a lack of awareness of programs such as rent assistance, unemployment benefits, or stimulus checks. The spread of misleading and false news about immigrants poses a significant societal problem. Cabieses et al. (2024) stated that national leaders' and public figures' stigmatizing rhetoric about immigrants can fundamentally influence public perceptions of immigrants. They also found that fake news and narratives that equate immigrants with crime spread rapidly on social media, fueling feelings of fear and insecurity.

Psychological problems are frequently emphasized in the literature as one of the most critical problems experienced by immigrants in their host countries. The psychological problems experienced by immigrants often present a complex picture, fueled by both pre-migration traumas and post-migration structural challenges (Tomren & Opaas, 2024). Traumatic life experiences are considered one of the most consistent and powerful determinants of mental health problems such as post-traumatic stress disorder (PTSD), depression, and anxiety in immigrant communities (Fadhlia et al., 2025). The acculturation process and fear of stigma are among the most significant sources of psychological stress for immigrants. Acculturation is considered a multidimensional process that can produce stress, identity conflict, and emotional tension beyond integration. Furthermore, fear of stigma creates a critical barrier that exacerbates immigrants' psychological problems by preventing them from seeking mental health support (Kosic, 2025). Uncertain legal status and fear of deportation are also significant factors that undermine immigrants' psychological well-being. These conditions exacerbate post-traumatic stress symptoms and emotional distress, placing an additional burden on mental health (Efremov, 2025). In their study of Syrian refugees living in Turkey for extended periods, Yılmaz et al. (2024) found that pre-migration traumas, such as war and violence, compounded by the challenges encountered after migration. Findings indicate that structural stressors such as corruption, unemployment, discrimination, and adjustment difficulties exacerbate existing psychological vulnerabilities and significantly contribute to the exacerbation of Post-Traumatic Stress Disorder (PTSD) symptoms. Lechner-Meichsner et al. (2024) also demonstrated that post-migration life challenges are strongly associated with the symptom severity of post-traumatic stress disorder (PTSD), complex PTSD (cPTSD), and complicated grief (PGD). Della Rocca et al. (2025) demonstrated that a significant portion of immigrants treated in psychiatric wards in Italy experience acculturative stress, and this stress is associated with negative clinical outcomes. Choi and Kang (2025) also show that adjustment stress in older Asian immigrants not only increases depression levels but is also linked to physical health problems such as hypertension and obesity. Özaslan et al. (2024) show that self-stigma is one of the primary barriers limiting access to mental health services among Syrian refugee adolescents. Findings indicate that self-stigma increases as symptoms of stress, anxiety, and depression increase, significantly reducing the willingness to seek it. Furthermore, Deng and Rose (2025) suggest that racial and ethnic minority groups, including immigrants, experience higher levels of public

and self-stigma compared to white Americans, creating a significant barrier to accessing professional mental health services.

The results of the literature review reveal the need for a multidimensional examination of the problems faced by immigrants in host countries. In this context, economic, political, social, and psychological factors are considered. Existing research often assesses these indicators independently. This creates a significant gap in determining which criteria set is prioritized. The study aims to address this deficiency through the development of a new decision-making model.

3. Methodology

This part defines the formulations of BLFSs, distance-based experts' weighting approach, and COWEB, respectively. While fuzzy logic is used to measure ambiguity in linguistic expressions, the agreement-based distance-based experts' weighting method is used to determine the significance coefficient in experts' evaluations. The COWEB method is applied to weight the main criteria. Figure 1 illustrates this process.

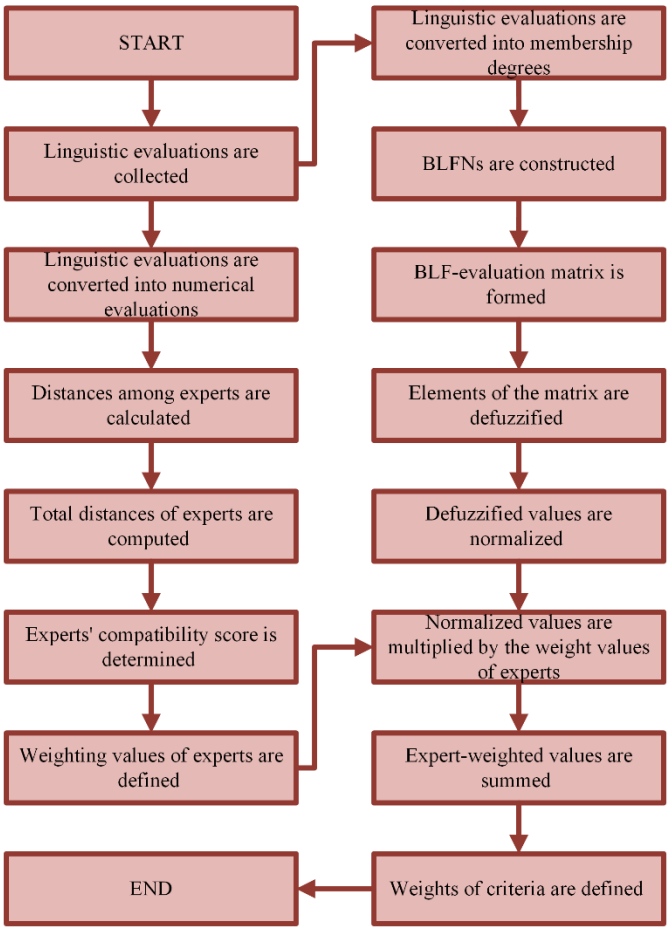


Figure 1: Process

3.1. BLFSs

The meaning of linguistic expressions varies depending on their source. The meaning of a word differs according to the characteristics of the person speaking it. Similarly, the membership of evaluations among decision-makers varies according to the expert's leadership style. In other words, the numerical equivalent of evaluations varies as a natural consequence of the multi-

component behavioral intensity structure of the leadership concept. Therefore, it is necessary to calculate memberships according to leadership styles. Furthermore, since a decision-maker does not exhibit a single leadership characteristic, this definition needs to be described using a fuzzy set. For this reason, BLFSs constructed with functions according to leadership type are developed.

Leadership styles are generally categorized as authoritarian, democratic, transformational, laissez-faire, and servant. When examining the characteristics of these leadership types, authoritarian leadership exhibits dominant behavior above a threshold value. Therefore, the evaluations of this type of expert are expressed using an exponential function. Experts exhibiting democratic leadership, on the other hand, demonstrate balance and transition sensitivity. Therefore, the best representative function is the logistic function, or sigmoid curve. Transformational leaders, due to the lack of control at extremely low and high decision points, are described by a Gaussian curve. Laissez-faire leadership, in contrast to authoritarian leadership, is represented by an inverse exponential function. Finally, experts in servant leadership exhibit an inverse Gaussian curve characteristic by assuming a sense of duty at extremely low and high decision points. Mathematically, the equivalent of the linguistic option in the authoritarian leadership type is calculated by Eq. (1), where the membership value of the linguistic option of the decisions is $\boldsymbol{\rho}$.

$$\boldsymbol{\rho_{au}(\rho) = e^{\rho-1}} \quad (1)$$

Since ρ is a value between zero and one, (ρ-1) is between -1 and 0. Therefore, the range of the expression in Eq. (1) is between 0 and 1. Similarly, the equivalent of ρ in the democratic leadership type is obtained with Eq. (2).

$$\boldsymbol{\rho_{dc}(\rho) = \frac{1}{1 + e^{-10(\rho-0.5)}}} \quad (2)$$

Similarly, since ρ is between 0 and 1, it is obvious that the range of the expression in Eq. (2) is also between 0 and 1. The equivalent of ρ in transformational leadership is determined by Eq. (3).

$$\boldsymbol{\rho_{tf}(\rho) = e^{-\frac{\rho^2}{2}}} \quad (3)$$

Since the value of ρ is between 0 and 1, the expression $\frac{\boldsymbol{\rho^2}}{\boldsymbol{2}}$ is between 0 and 0.5, and the counterpart of the expression in Eq. (3) is between 0 and 1. The meaning of ρ in the Laissez Faire leadership type is computed with Eq. (4).

$$\boldsymbol{\rho_{lf}(\rho) = e^{-\rho}} \quad (4)$$

The result of this function is between 0 and 1. Finally, the servant leadership type equivalent is estimated by Eq. (5).

$$\boldsymbol{\rho_{sr}(\rho) = -e^{-\frac{\rho^2}{2}} + 1} \quad (5)$$

The first term of this function is between -1 and 0 due to the explanation in Eq. (3). Adding this result to 1 reveals that the function's range is between 0 and 1.

A BLFS that includes these five leadership type functions as membership degrees has the form in Eq. (6).

$$\widetilde{\boldsymbol{B}} = \left\{\langle \boldsymbol{\rho}, \left(\boldsymbol{\rho_{au}(\rho)}, \boldsymbol{\rho_{dc}(\rho)}, \boldsymbol{\rho_{tf}(\rho)}, \boldsymbol{\rho_{lf}(\rho)}, \boldsymbol{\rho_{sr}(\rho)}\right) \boldsymbol{\rho} \in [\mathbf{0}, \mathbf{1}]\right\} \quad (6)$$

Assume that $\widetilde{\boldsymbol{B}}_{\mathbf{1}} = \left(\boldsymbol{\rho}_{au_{\widetilde{B}_1}}, \boldsymbol{\rho}_{dc_{\widetilde{B}_1}}, \boldsymbol{\rho}_{tf_{\widetilde{B}_1}}, \boldsymbol{\rho}_{lf_{\widetilde{B}_1}}, \boldsymbol{\rho}_{sr_{\widetilde{B}_1}}\right)$ and $\widetilde{\boldsymbol{B}}_{\mathbf{2}} = \left(\boldsymbol{\rho}_{au_{\widetilde{B}_2}}, \boldsymbol{\rho}_{dc_{\widetilde{B}_2}}, \boldsymbol{\rho}_{tf_{\widetilde{B}_2}}, \boldsymbol{\rho}_{lf_{\widetilde{B}_2}}, \boldsymbol{\rho}_{sr_{\widetilde{B}_2}}\right)$ are two BLFNs and $\boldsymbol{\xi}$ is constant positive number. Then, some mathematical processes are identified using Eq.s (7) – (10).

$$\widetilde{\boldsymbol{B}}_{\mathbf{1}} \oplus \widetilde{\boldsymbol{B}}_{\mathbf{2}} = \begin{pmatrix} \boldsymbol{\rho}_{au_{\widetilde{B}_1}} + \boldsymbol{\rho}_{au_{\widetilde{B}_2}} - \boldsymbol{\rho}_{au_{\widetilde{B}_1}}\boldsymbol{\rho}_{au_{\widetilde{B}_2}}, \boldsymbol{\rho}_{dc_{\widetilde{B}_1}} + \boldsymbol{\rho}_{dc_{\widetilde{B}_2}} - \boldsymbol{\rho}_{dc_{\widetilde{B}_1}}\boldsymbol{\rho}_{dc_{\widetilde{B}_2}}, \\ \boldsymbol{\rho}_{tf_{\widetilde{B}_1}}\boldsymbol{\rho}_{tf_{\widetilde{B}_2}}, \boldsymbol{\rho}_{lf_{\widetilde{B}_1}}\boldsymbol{\rho}_{lf_{\widetilde{B}_2}}, \boldsymbol{\rho}_{sr_{\widetilde{B}_1}} + \boldsymbol{\rho}_{sr_{\widetilde{B}_2}} - \boldsymbol{\rho}_{sr_{\widetilde{B}_1}}\boldsymbol{\rho}_{sr_{\widetilde{B}_2}} \end{pmatrix} \quad (7)$$

$$\widetilde{\boldsymbol{B}}_{\mathbf{1}} \otimes \widetilde{\boldsymbol{B}}_{\mathbf{2}} = \begin{pmatrix} \boldsymbol{\rho}_{au_{\widetilde{B}_1}}\boldsymbol{\rho}_{au_{\widetilde{B}_2}}, \boldsymbol{\rho}_{dc_{\widetilde{B}_1}}\boldsymbol{\rho}_{dc_{\widetilde{B}_2}}, \boldsymbol{\rho}_{tf_{\widetilde{B}_1}} + \boldsymbol{\rho}_{tf_{\widetilde{B}_2}} - \boldsymbol{\rho}_{tf_{\widetilde{B}_1}}\boldsymbol{\rho}_{tf_{\widetilde{B}_2}}, \\ \boldsymbol{\rho}_{lf_{\widetilde{B}_1}} + \boldsymbol{\rho}_{lf_{\widetilde{B}_2}} - \boldsymbol{\rho}_{lf_{\widetilde{B}_1}}\boldsymbol{\rho}_{lf_{\widetilde{B}_2}}, \boldsymbol{\rho}_{sr_{\widetilde{B}_1}}\boldsymbol{\rho}_{sr_{\widetilde{B}_2}} \end{pmatrix} \quad (8)$$

$$\boldsymbol{\xi}\widetilde{\boldsymbol{B}}_{\mathbf{1}} = \left(\mathbf{1} - \left(\mathbf{1} - \boldsymbol{\rho}_{au_{\widetilde{B}_1}}\right)^{\boldsymbol{\xi}}, \mathbf{1} - \left(\mathbf{1} - \boldsymbol{\rho}_{dc_{\widetilde{B}_1}}\right)^{\boldsymbol{\xi}}, \boldsymbol{\rho}_{tf_{\widetilde{B}_1}}^{\boldsymbol{\xi}}, \boldsymbol{\rho}_{lf_{\widetilde{B}_1}}^{\boldsymbol{\xi}}, \mathbf{1} - \left(\mathbf{1} - \boldsymbol{\rho}_{sr_{\widetilde{B}_1}}\right)^{\boldsymbol{\xi}}\right) \quad (9)$$

$$\widetilde{\boldsymbol{B}}_{\mathbf{1}}^{\boldsymbol{\xi}} = \left(\boldsymbol{\rho}_{au_{\widetilde{B}_1}}^{\boldsymbol{\xi}}, \boldsymbol{\rho}_{dc_{\widetilde{B}_1}}^{\boldsymbol{\xi}}, \mathbf{1} - \left(\mathbf{1} - \boldsymbol{\rho}_{tf_{\widetilde{B}_1}}\right)^{\boldsymbol{\xi}}, \mathbf{1} - \left(\mathbf{1} - \boldsymbol{\rho}_{lf_{\widetilde{B}_1}}\right)^{\boldsymbol{\xi}}, \boldsymbol{\rho}_{sr_{\widetilde{B}_1}}^{\boldsymbol{\xi}}\right) \quad (10)$$

Finally, the score and accuracy functions of $\widetilde{\boldsymbol{B}}_{\mathbf{1}}$ are established with the help of Eq.s (11) and (12), respectively.

$$\mathbb{S}\left(\widetilde{\boldsymbol{B}}_{\mathbf{1}}\right) = \boldsymbol{\rho}_{au_{\widetilde{B}_1}} + \boldsymbol{\rho}_{dc_{\widetilde{B}_1}} - \boldsymbol{\rho}_{tf_{\widetilde{B}_1}} - \boldsymbol{\rho}_{lf_{\widetilde{B}_1}} + \boldsymbol{\rho}_{sr_{\widetilde{B}_1}} \quad (11)$$

$$\hbar\left(\widetilde{\boldsymbol{B}}_{\mathbf{1}}\right) = \frac{\boldsymbol{\rho}_{au_{\widetilde{B}_1}} + \boldsymbol{\rho}_{dc_{\widetilde{B}_1}} + \boldsymbol{\rho}_{tf_{\widetilde{B}_1}} + \boldsymbol{\rho}_{lf_{\widetilde{B}_1}} + \boldsymbol{\rho}_{sr_{\widetilde{B}_1}}}{\mathbf{5}} \quad (12)$$

3.2. Distance-based Experts' Weighting Approach

Agreement among experts significantly impacts the accuracy of results. Consensual decisions lead to more effective outcomes. In this context, a distance-based calculation approach is developed to prioritize expert evaluations that agree (Karagiannis and Karagiannis, 2025). The calculation for this approach is as follows.

First, criteria are established. These criteria are evaluated within the framework of COWEB. In other words, the expert first identifies the best criterion and then evaluates the other criteria based on this criterion using the linguistic expressions in Table 1.

Table 1: Linguistic Expressions

Abb	Linguistic	ρ	Scale
VL	Very Low	.1	1
L	Low	03	2
M	Medium	.5	3
H	High	.7	4
VH	Very High	.9	5
Best	Best	1	6

Afterwards, linguistic evaluations are converted into scale values. Thus, numerical evaluation matrix of k^{th} expert illustrated in Eq. (13) is obtained.

$$\boldsymbol{X^k} = \left[\boldsymbol{x_j^k}\right]_{\mathbf{1}\times\boldsymbol{n}} \quad (13)$$

Wherein n is the number of criteria. Next, distances among experts are calculated using Eq. (14).

$$\boldsymbol{D_{a,b} = \sqrt{\sum_{j=1}^{n} \left(x_j^a - x_j^b\right)^2}} \quad (\mathbf{14})$$

Next, total distances of experts are computed with Eq. (15).

$$\boldsymbol{T_k = \sum_{i=1}^{e} D_{i,k}} \quad (\mathbf{15})$$

Wherein e is the number of experts. The experts' compatibility score is determined by Eq. (16) based on these total distance value.

$$\boldsymbol{c_k = \frac{1}{T_k}} \quad (\mathbf{16})$$

Finally, the weighting values of experts are defined as Eq. (17).

$$\boldsymbol{ew_k = \frac{c_k}{\sum_{k=1}^{e} c_k}} \quad (\mathbf{17})$$

3.3. BLF-COWEB

COWEB is a new approach that calculates the weighting of criteria by evaluating other criteria according to the best criterion. Its greatest advantages include its fast and practical calculation method. Calculations using BLFNs are as follows (Eti et al., 2025).

Firstly, linguistic evaluations are converted into membership degree $(\boldsymbol{\rho})$ according to Table 1. Next, the BLFNs are constructed using Eq.s (1) – (6). Thus, the BLF-evaluation matrix formed in Eq. (18) is created.

$$\boldsymbol{\widetilde{X} = \left[\widetilde{x}_{ij}\right]_{e \times n}} \quad (\mathbf{18})$$

Wherein $\boldsymbol{\widetilde{x}_{ij} = \left(\rho_{au_{\widetilde{x}_{ij}}}, \rho_{dc_{\widetilde{x}_{ij}}}, \rho_{tf_{\widetilde{B}_1}}, \rho_{lf_{\widetilde{x}_{ij}}}, \rho_{sr_{\widetilde{x}_{ij}}}\right)}$. Later, the elements of this matrix are defuzzified with the help of score function as Eq. (19). To obtain positive values, the score value is added to 1.

$$\boldsymbol{x_{ij} = \rho_{au_{\widetilde{x}_{ij}}} + \rho_{dc_{\widetilde{x}_{ij}}} - \rho_{tf_{\widetilde{B}_1}} - \rho_{lf_{\widetilde{x}_{ij}}} + \rho_{sr_{\widetilde{x}_{ij}}} + 1} \quad (\mathbf{19})$$

Afterwards, the defuzzified values are normalized by Eq. (20).

$$\boldsymbol{y_{ij} = \frac{x_{ij}}{\sum_{j=1}^{n} x_{ij}}} \quad (\mathbf{20})$$

The normalized values are multiplied by the weight values of experts. Eq. (21) is used for this.

$$\boldsymbol{g_{ij} = ew_i \times y_{ij}} \quad (\mathbf{21})$$

Next, the expert-weighted values are summed with Eq. (22).

$$\boldsymbol{z_j = \sum_{i=1}^{e} g_{ij}} \quad (\mathbf{22})$$

Finally, the weights of criteria are defined as Eq. (23).

$$w_j = \frac{z_j}{\sum_{j=1}^{n} z_j} \quad (23)$$

4. Analysis

This part shares the results of analysis.

4.1. Weighting of Experts

Problems faced by migrants in host countries are identified for prioritization. These 14 problems, along with the abbreviations used in the analyses, are given in Table 2.

Table 2: Problems with Abbreviations

Problem	Abb
Insufficient employment opportunities	EMP
Underemployment	UND
Wage inequality	WIN
Constraints on economic mobility and equality	EME
Precariatism	PRE
Problems with political participation	POL
Discriminatory policies	DSP
Loneliness and social isolation	ISO
Experiences of discrimination	DIS
Difficulties in accessing social services	SOC
Issues related to legal status	LEG
Trauma-related problems	TRM
Acculturation-related problems	ACC
Fear of deportation	DEP

Migrants face a wide range of interconnected challenges in host countries that affect their economic stability, social integration, and psychological well being. Insufficient employment opportunities limit access to stable and formal jobs, while underemployment forces many migrants to work in positions that do not reflect their skills or qualifications. Wage inequality further deepens economic vulnerability by creating persistent income gaps between migrants and native workers, and constraints on economic mobility and equality restrict career advancement due to barriers in credential recognition and licensing systems. These conditions often result in precariatism, characterized by insecure, temporary, and low protection employment. In the political sphere, problems with political participation reduce migrants' ability to influence decision making processes, while discriminatory policies based on nationality or migration status institutionalize exclusion and limit access to rights and legal protection. Socially, loneliness and social isolation emerge as a result of language barriers and weak social networks, and experiences of discrimination through stigmatization and marginalization undermine social cohesion and trust in institutions. Migrants also face difficulties in accessing social services such as healthcare, education, housing, and welfare due to bureaucratic obstacles and lack of information. Issues related to legal status create ongoing uncertainty regarding residence and employment, which shapes daily life and increases vulnerability. In addition, trauma related problems resulting from conflict, forced displacement,

and dangerous migration journeys raise the risk of psychological distress, while acculturation related problems during cultural adaptation lead to identity conflicts and emotional strain. Finally, fear of deportation, particularly among undocumented migrants, generates chronic stress and discourages engagement with public institutions and essential services. These problems are evaluated by ten experts with at least 11 years of experience in migration issues, using the linguistic expressions in Table 1. The linguistic evaluations are shown in Table 3.

Table 3: Linguistic Evaluations

	EMP	**UND**	**WIN**	**EME**	**PRE**	**POL**	**DSP**
Expert1	H	BEST	H	VH	L	L	VL
Expert2	H	BEST	H	L	VL	L	VL
Expert3	H	M	BEST	H	L	L	VL
Expert4	M	VH	BEST	H	VL	M	VL
Expert5	M	VH	BEST	M	VL	VL	L
Expert6	BEST	M	VH	H	L	L	L
Expert7	BEST	VH	VH	H	L	L	L
Expert8	M	M	BEST	H	L	M	L
Expert9	H	H	H	BEST	M	L	L
Expert10	M	M	BEST	H	L	L	M
	ISO	**DIS**	**SOC**	**LEG**	**TRM**	**ACC**	**DEP**
Expert1	VL	L	VL	VL	VL	L	L
Expert2	L	VL	VL	VL	VL	VL	L
Expert3	M	L	L	VL	L	L	L
Expert4	L	L	L	L	VL	M	L
Expert5	L	L	VL	M	M	L	L
Expert6	VL	L	VL	VL	L	L	VL
Expert7	VL	L	VL	L	L	M	M
Expert8	VL	VL	L	VL	L	M	VL
Expert9	L	L	L	L	VL	VL	L
Expert10	L	L	L	VL	L	L	VL

Afterwards, linguistic evaluations are converted into scale values. The numerical evaluations are shared in Table 4.

Table 4: Numerical Evaluations

	EMP	**UND**	**WIN**	**EME**	**PRE**	**POL**	**DSP**
Expert1	4	6	4	5	2	2	1
Expert2	4	6	4	2	1	2	1
Expert3	4	3	6	4	2	2	1
Expert4	3	5	6	4	1	3	1
Expert5	3	5	6	3	1	1	2
Expert6	6	3	5	4	2	2	2
Expert7	6	5	5	4	2	2	2
Expert8	3	3	6	4	2	3	2
Expert9	4	4	4	6	3	2	2
Expert10	3	3	6	4	2	2	3
	ISO	**DIS**	**SOC**	**LEG**	**TRM**	**ACC**	**DEP**
Expert1	1	2	1	1	1	2	2
Expert2	2	1	1	1	1	1	2

Expert3	3	2	2	1	2	2	2
Expert4	2	2	2	2	1	3	2
Expert5	2	2	1	3	3	2	2
Expert6	1	2	1	1	2	2	1
Expert7	1	2	1	2	2	3	3
Expert8	1	1	2	1	2	3	1
Expert9	2	2	2	2	1	1	2
Expert10	2	2	2	1	2	2	1

Next, Euclidean distances among experts are calculated using Eq. (14). The distances are illustrated in Table 5.

Table 5: Euclidean Distances among Experts

	Expert1	**Expert2**	**Expert3**	**Expert4**	**Expert5**	**Expert6**	**Expert7**	**Expert8**	**Expert9**	**Expert10**
Expert1		3.606	4.472	3.606	4.690	4.243	3.464	4.690	3.317	4.796
Expert2	3.606		4.796	4.243	4.359	5.000	4.583	5.385	5.292	5.292
Expert3	4.472	4.796		3.317	4.000	3.464	4.243	3.162	3.873	2.646
Expert4	3.606	4.243	3.317		3.606	4.796	4.123	3.317	4.472	3.742
Expert5	4.690	4.359	4.000	3.606		4.899	4.243	4.472	5.196	3.873
Expert6	4.243	5.000	3.464	4.796	4.899		3.162	3.742	4.123	3.606
Expert7	3.464	4.583	4.243	4.123	4.243	3.162		4.690	4.359	4.796
Expert8	4.690	5.385	3.162	3.317	4.472	3.742	4.690		4.583	2.236
Expert9	3.317	5.292	3.873	4.472	5.196	4.123	4.359	4.583		4.000
Expert10	4.796	5.292	2.646	3.742	3.873	3.606	4.796	2.236	4.000	

Next, Euclidean distances of experts are summed with Eq. (15). Then, the experts' compatibility score is determined by Eq. (16). The results are summarized in Table 6.

Table 6: Total Distances and Compatibility Scores

	T	**c**
Expert1	36.883	.027
Expert2	42.554	.023
Expert3	33.972	.029
Expert4	35.220	.028
Expert5	39.338	.025
Expert6	37.034	.027
Expert7	37.662	.027
Expert8	36.277	.028
Expert9	39.214	.026
Expert10	34.985	.029

Finally, the prioritize expert evaluations are defined as Eq. (17). The result is presented in Figure 2.

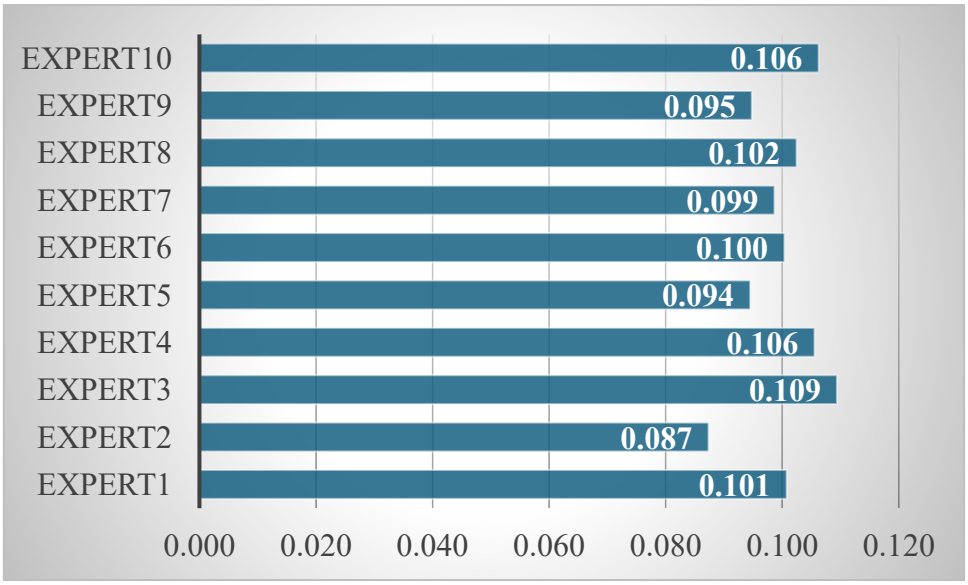


Figure 2: Weight Values of Experts

4.2. Weighting of Problems

The linguistic evaluations in Table 3 are converted to the membership degrees in Table 1, and BLFNs are obtained using Equation (1) - (6). BLF-evaluation matrix is expressed in Table 7.

Table 7: BLF-Evaluation Matrix

	EMP	UND	WIN	EME	PRE	POL	DSP
Expert1	(.741,.881,0,.497,1)	(1,.993,0,.368,1)	(.741,.881,0,.497,1)	(.905,.982,0,.407,1)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)	(.407,.018,.607,.905,.393)
Expert2	(.741,.881,0,.497,1)	(1,.993,0,.368,1)	(.741,.881,0,.497,1)	(.497,.119,.011,.741,.989)	(.407,.018,.607,.905,.393)	(.497,.119,.011,.741,.989)	(.407,.018,.607,.905,.393)
Expert3	(.741,.881,0,.497,1)	(.607,.5,0,.607,1)	(1,.993,0,.368,1)	(.741,.881,0,.497,1)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)	(.407,.018,.607,.905,.393)
Expert4	(.607,.5,0,.607,1)	(.905,.982,0,.407,1)	(1,.993,0,.368,1)	(.741,.881,0,.497,1)	(.407,.018,.607,.905,.393)	(.607,.5,0,.607,1)	(.407,.018,.607,.905,.393)
Expert5	(.607,.5,0,.607,1)	(.905,.982,0,.407,1)	(1,.993,0,.368,1)	(.607,.5,0,.607,1)	(.407,.018,.607,.905,.393)	(.407,.018,.607,.905,.393)	(.497,.119,.011,.741,.989)
Expert6	(1,.993,0,.368,1)	(.607,.5,0,.607,1)	(.905,.982,0,.407,1)	(.741,.881,0,.497,1)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)
Expert7	(1,.993,0,.368,1)	(.905,.982,0,.407,1)	(.905,.982,0,.407,1)	(.741,.881,0,.497,1)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)
Expert8	(.607,.5,0,.607,1)	(.607,.5,0,.607,1)	(1,.993,0,.368,1)	(.741,.881,0,.497,1)	(.497,.119,.011,.741,.989)	(.607,.5,0,.607,1)	(.497,.119,.011,.741,.989)
Expert9	(.741,.881,0,.497,1)	(.741,.881,0,.497,1)	(.741,.881,0,.497,1)	(1,.993,0,.368,1)	(.607,.5,0,.607,1)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)
Expert10	(.607,.5,0,.607,1)	(.607,.5,0,.607,1)	(1,.993,0,.368,1)	(.741,.881,0,.497,1)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)	(.607,.5,0,.607,1)
	ISO	DIS	SOC	LEG	TRM	ACC	DEP
Expert1	(.407,.018,.607,.905,.393)	(.497,.119,.011,.741,.989)	(.407,.018,.607,.905,.393)	(.407,.018,.607,.905,.393)	(.407,.018,.607,.905,.393)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)
Expert2	(.497,.119,.011,.741,.989)	(.407,.018,.607,.905,.393)	(.407,.018,.607,.905,.393)	(.407,.018,.607,.905,.393)	(.407,.018,.607,.905,.393)	(.407,.018,.607,.905,.393)	(.497,.119,.011,.741,.989)
Expert3	(.607,.5,0,.607,1)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)	(.407,.018,.607,.905,.393)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)
Expert4	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)	(.407,.018,.607,.905,.393)	(.607,.5,0,.607,1)	(.497,.119,.011,.741,.989)
Expert5	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)	(.407,.018,.607,.905,.393)	(.607,.5,0,.607,1)	(.607,.5,0,.607,1)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)
Expert6	(.407,.018,.607,.905,.393)	(.497,.119,.011,.741,.989)	(.407,.018,.607,.905,.393)	(.407,.018,.607,.905,.393)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)	(.407,.018,.607,.905,.393)
Expert7	(.407,.018,.607,.905,.393)	(.497,.119,.011,.741,.989)	(.407,.018,.607,.905,.393)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)	(.607,.5,0,.607,1)	(.607,.5,0,.607,1)
Expert8	(.407,.018,.607,.905,.393)	(.407,.018,.607,.905,.393)	(.497,.119,.011,.741,.989)	(.407,.018,.607,.905,.393)	(.497,.119,.011,.741,.989)	(.607,.5,0,.607,1)	(.407,.018,.607,.905,.393)
Expert9	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)	(.407,.018,.607,.905,.393)	(.407,.018,.607,.905,.393)	(.497,.119,.011,.741,.989)
Expert10	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)	(.407,.018,.607,.905,.393)	(.497,.119,.011,.741,.989)	(.497,.119,.011,.741,.989)	(.407,.018,.607,.905,.393)

Later, the defuzzified matrix are constructed with the help of score function as Eq. (19). This matrix is shown in Table 8.

Table 8: Defuzzified Matrix

	EMP	UND	WIN	EME	PRE	POL	DSP
Expert1	3.125	3.625	3.125	3.480	1.853	1.853	.307
Expert2	3.125	3.625	3.125	1.853	.307	1.853	.307
Expert3	3.125	2.500	3.625	3.125	1.853	1.853	.307
Expert4	2.500	3.480	3.625	3.125	.307	2.500	.307
Expert5	2.500	3.480	3.625	2.500	.307	.307	1.853
Expert6	3.625	2.500	3.480	3.125	1.853	1.853	1.853
Expert7	3.625	3.480	3.480	3.125	1.853	1.853	1.853
Expert8	2.500	2.500	3.625	3.125	1.853	2.500	1.853
Expert9	3.125	3.125	3.125	3.625	2.500	1.853	1.853
Expert10	2.500	2.500	3.625	3.125	1.853	1.853	2.500
	ISO	**DIS**	**SOC**	**LEG**	**TRM**	**ACC**	**DEP**
Expert1	.307	1.853	.307	.307	.307	1.853	1.853
Expert2	1.853	.307	.307	.307	.307	.307	1.853
Expert3	2.500	1.853	1.853	.307	1.853	1.853	1.853
Expert4	1.853	1.853	1.853	1.853	.307	2.500	1.853
Expert5	1.853	1.853	.307	2.500	2.500	1.853	1.853
Expert6	.307	1.853	.307	.307	1.853	1.853	.307
Expert7	.307	1.853	.307	1.853	1.853	2.500	2.500
Expert8	.307	.307	1.853	.307	1.853	2.500	.307
Expert9	1.853	1.853	1.853	1.853	.307	.307	1.853
Expert10	1.853	1.853	1.853	.307	1.853	1.853	.307

Afterwards, the normalized matrix is calculated by Eq. (20). The normalized matrix is given in Table 9.

Table 9: Normalized Matrix

	EMP	UND	WIN	EME	PRE	POL	DSP
Expert1	.129	.150	.129	.144	.077	.077	.013
Expert2	.161	.187	.161	.095	.016	.095	.016
Expert3	.110	.088	.127	.110	.065	.065	.011
Expert4	.090	.125	.130	.112	.011	.090	.011
Expert5	.092	.128	.133	.092	.011	.011	.068
Expert6	.145	.100	.139	.125	.074	.074	.074
Expert7	.119	.114	.114	.103	.061	.061	.061
Expert8	.098	.098	.143	.123	.073	.098	.073
Expert9	.107	.107	.107	.125	.086	.064	.064
Expert10	.090	.090	.130	.112	.067	.067	.090
	ISO	**DIS**	**SOC**	**LEG**	**TRM**	**ACC**	**DEP**
Expert1	.013	.077	.013	.013	.013	.077	.077
Expert2	.095	.016	.016	.016	.016	.016	.095
Expert3	.088	.065	.065	.011	.065	.065	.065
Expert4	.066	.066	.066	.066	.011	.090	.066

Expert5	.068	.068	.011	.092	.092	.068	.068
Expert6	.012	.074	.012	.012	.074	.074	.012
Expert7	.010	.061	.010	.061	.061	.082	.082
Expert8	.012	.012	.073	.012	.073	.098	.012
Expert9	.064	.064	.064	.064	.011	.011	.064
Expert10	.067	.067	.067	.011	.067	.067	.011

The weighted values are computed by Eq. (21). The weighted matrix is illustrated in Table 10.

Table 10: Weighted Values

	EMP	**UND**	**WIN**	**EME**	**PRE**	**POL**	**DSP**
Expert1	.013	.015	.013	.015	.008	.008	.001
Expert2	.014	.016	.014	.008	.001	.008	.001
Expert3	.012	.010	.014	.012	.007	.007	.001
Expert4	.009	.013	.014	.012	.001	.009	.001
Expert5	.009	.012	.013	.009	.001	.001	.006
Expert6	.015	.010	.014	.013	.007	.007	.007
Expert7	.012	.011	.011	.010	.006	.006	.006
Expert8	.010	.010	.015	.013	.007	.010	.007
Expert9	.010	.010	.010	.012	.008	.006	.006
Expert10	.010	.010	.014	.012	.007	.007	.010
	ISO	**DIS**	**SOC**	**LEG**	**TRM**	**ACC**	**DEP**
Expert1	.001	.008	.001	.001	.001	.008	.008
Expert2	.008	.001	.001	.001	.001	.001	.008
Expert3	.010	.007	.007	.001	.007	.007	.007
Expert4	.007	.007	.007	.007	.001	.009	.007
Expert5	.006	.006	.001	.009	.009	.006	.006
Expert6	.001	.007	.001	.001	.007	.007	.001
Expert7	.001	.006	.001	.006	.006	.008	.008
Expert8	.001	.001	.007	.001	.007	.010	.001
Expert9	.006	.006	.006	.006	.001	.001	.006
Expert10	.007	.007	.007	.001	.007	.007	.001

Next, the total values of weighted values for each problem are estimated with Eq. (22). The total values of problems are shared in Table 11.

Table 11: Total Values

	EMP	**UND**	**WIN**	**EME**	**PRE**	**POL**	**DSP**
Total	.113	.117	.131	.114	.055	.070	.048
	ISO	DIS	SOC	LEG	TRM	ACC	DEP
Total	.049	.057	.041	.035	.049	.066	.054

Finally, the weights of criteria are defined as Eq. (23). The results are visualized in Figure 3.

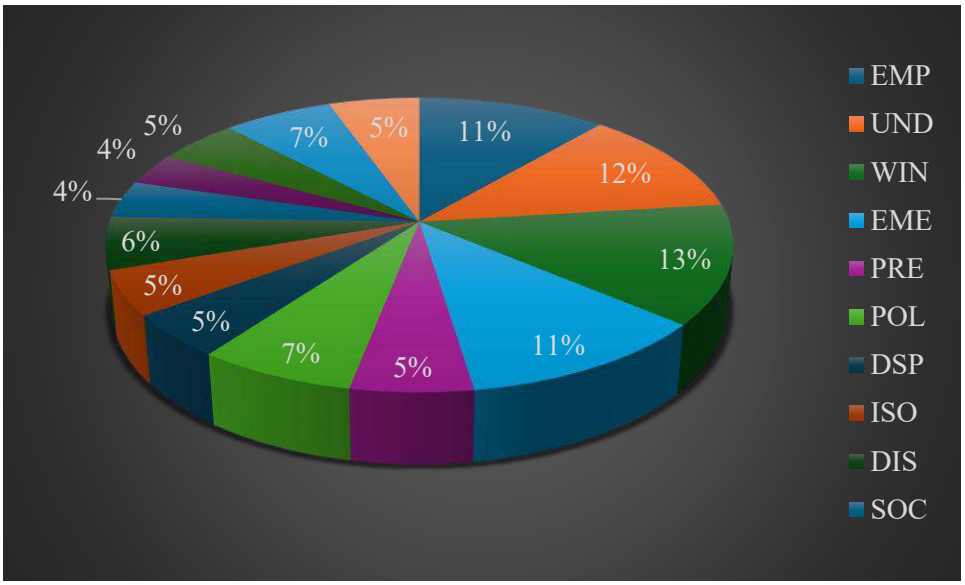


Figure 3: Weights of Problems

As can be seen from the weights reported in Figure 3, wage inequality with a value of 0.131 and underemployment with a value of 0.117 emerge as the most critical problems faced by migrants in host countries. This finding indicates that labor market related challenges constitute the core dimension of migrant vulnerability. Wage inequality reflects the systematic undervaluation of migrant labor, where migrants often receive lower wages than native workers despite performing similar or identical tasks. This situation not only limits migrants' economic well-being but also reinforces broader patterns of social inequality and exclusion. Underemployment, on the other hand, highlights the mismatch between migrants' skills, education, and the jobs they can access, forcing many to accept positions below their qualification levels. The close weighting of these two problems suggests a strong interrelationship, as underemployment frequently leads to wage inequality by confining migrants to low skilled and low paid occupations. Together, these dynamics hinder economic mobility and prevent migrants from fully contributing to productivity and innovation in the host economy. From a policy perspective, these results underline the need for targeted state interventions. Governments should prioritize the recognition of foreign qualifications, streamline credential equivalency procedures, and strengthen labor market inspection mechanisms to ensure equal pay for equal work. In addition, active labor market policies, vocational training programs, and inclusive employment strategies can help reduce skill mismatch and promote fair labor market integration, thereby addressing the root causes of both wage inequality and underemployment simultaneously.

4.3. Sensitivity

To validate the robustness and reliability of the findings obtained from the proposed model, a second decision making method is employed for comparative purposes. In this context, the values included in the evaluation matrix are reanalyzed by using the SIWEC approach, which serves as an alternative weighting and assessment technique. The use of SIWEC allows the results to be cross checked and helps determine whether similar priority patterns emerge under a different analytical structure. By comparing the outcomes of the proposed model with those derived from SIWEC, the study aims to strengthen the credibility of the findings and reduce potential method specific bias. The results obtained from the SIWEC analysis are visually

presented in Figure 4, which enables a clearer comparison between the two methods and facilitates interpretation of consistency and divergence across problem rankings.

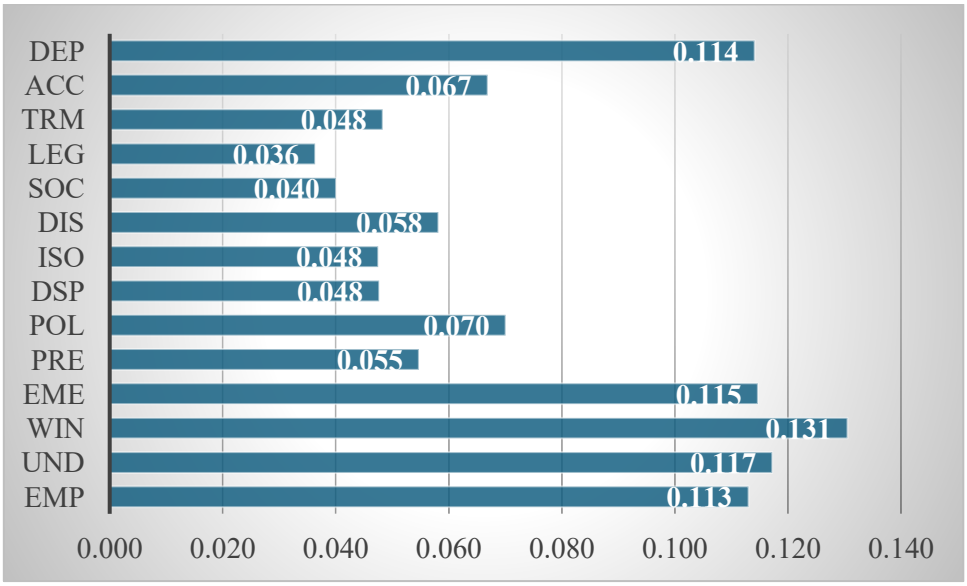


Figure 4: SIWEC Result

When Figure 4 is examined in detail, it can be observed that the most critical problems remain unchanged, with wage inequality and underemployment retaining the highest weights of 0.131 and 0.117, respectively. This consistency across methods indicates that the prioritization of migrant related problems is not sensitive to the choice of analytical technique. Furthermore, the Pearson correlation coefficient between the results obtained from the two methods is calculated as 0.886, while the Spearman rank correlation coefficient is found to be 0.921. These high correlation values demonstrate a strong linear and ordinal association between the two sets of results. Such findings suggest a high level of agreement in both the magnitude and ranking of the criteria. Consequently, the convergence of outcomes and the strength of the correlation coefficients provide strong evidence for the robustness and reliability of the proposed model and confirm the stability of the empirical findings.

In addition to the methodological comparison, the analyses are further extended by increasing the expert coefficients presented in Figure 2 by 10 percent to conduct a sensitivity and robustness test. This procedure aims to examine whether moderate changes in expert importance weights lead to significant variations in the final prioritization results. By adjusting the expert coefficients, the study evaluates the stability of the proposed model under alternative weighting scenarios and assesses its resistance to potential fluctuations in expert influence. The results of this scenario-based analysis, conducted within the COWEB framework, are reported in Table 12. The findings presented in this table provide additional evidence regarding the consistency of the outcomes and help confirm that the prioritization results are not driven by minor changes in expert weighting assumptions.

Table 12: COWEB's Scenario Analysis Results

	Expert1	Expert2	Expert3	Expert4	Expert5	Expert6	Expert7	Expert8	Expert9	Expert10
EMP	.113	.114	.113	.113	.113	.114	.113	.113	.113	.113
UND	.118	.118	.117	.117	.117	.117	.117	.117	.117	.117
WIN	.131	.131	.131	.131	.131	.131	.131	.131	.131	.131
EME	.115	.114	.114	.114	.114	.114	.114	.114	.114	.114
PRE	.055	.054	.055	.054	.054	.055	.055	.055	.055	.055
POL	.070	.071	.070	.071	.070	.070	.070	.071	.070	.070
DSP	.048	.048	.047	.048	.048	.048	.048	.048	.048	.048
ISO	.049	.050	.050	.049	.049	.049	.049	.049	.049	.049
DIS	.058	.057	.058	.058	.058	.058	.057	.057	.057	.058
SOC	.040	.040	.041	.041	.040	.040	.040	.041	.041	.041
LEG	.035	.035	.035	.036	.036	.035	.035	.035	.035	.035
TRM	.048	.048	.049	.048	.049	.049	.049	.049	.048	.049
ACC	.066	.065	.066	.066	.066	.066	.066	.066	.065	.066
DEP	.055	.055	.054	.054	.055	.054	.055	.054	.054	.054

According to the results presented in Table 12, the priority ranking of the first seven problems remains unchanged across all considered scenarios, indicating a high level of stability in the most critical problem set. This consistency suggests that the leading priorities are robust to variations in expert coefficients and are not sensitive to moderate changes in model assumptions. Such stability strengthens confidence in the reliability of the proposed approach and its ability to produce consistent outcomes under different conditions. In a similar manner, the same scenario analysis procedure is applied within the SIWEC framework to ensure comparability between the two methods. The scenario-based results obtained from the SIWEC analysis are reported in Table 13, which allows for a parallel evaluation of robustness and further supports the validity of the overall findings.

Table 13: SIWEC's Scenario Analysis Results

	Expert1	Expert2	Expert3	Expert4	Expert5	Expert6	Expert7	Expert8	Expert9	Expert10
EMP	.113	.113	.113	.113	.113	.113	.113	.113	.113	.113
UND	.118	.118	.117	.117	.117	.117	.117	.117	.117	.117
WIN	.131	.131	.131	.131	.131	.131	.130	.131	.130	.131
EME	.115	.115	.115	.115	.114	.115	.115	.115	.115	.115
PRE	.055	.054	.055	.054	.054	.055	.055	.055	.055	.055
POL	.070	.070	.070	.070	.069	.070	.070	.070	.070	.070
DSP	.047	.047	.047	.047	.048	.048	.048	.048	.048	.048
ISO	.047	.048	.048	.048	.048	.047	.047	.047	.048	.048
DIS	.058	.058	.058	.058	.058	.058	.058	.058	.058	.058
SOC	.040	.040	.040	.040	.040	.040	.040	.040	.040	.040
LEG	.036	.036	.036	.037	.037	.036	.037	.036	.037	.036
TRM	.048	.048	.048	.048	.049	.049	.048	.049	.048	.048
ACC	.067	.066	.067	.067	.067	.067	.067	.067	.066	.067
DEP	.115	.115	.114	.114	.114	.113	.115	.113	.114	.113

According to the findings reported in Table 13, only the first two problems maintain the same priority order across all scenarios, while the rankings of the remaining problems exhibit noticeable variations under different conditions. This result indicates that the SIWEC based outcomes are more sensitive to changes in expert coefficients and scenario assumptions. In contrast, the greater consistency observed in the COWEB based scenario analysis suggests a higher level of robustness and stability in its prioritization structure. Therefore, when the two methods are compared, the results obtained through COWEB demonstrate stronger resistance to parameter changes and provide more reliable and dependable outcomes. This comparison highlights the methodological superiority of COWEB in producing stable priority rankings, particularly in complex decision-making environments characterized by uncertainty and expert heterogeneity.

5. Discussion

The findings discussed in this study reinforce the growing consensus in the literature that wage inequality constitutes a central and structural dimension of migrants' disadvantage in host-country labour markets. Rather than being reducible to individual-level deficiencies such as language proficiency or human capital gaps, migrant–native wage differentials are increasingly understood as outcomes of institutionalized labour market segmentation. Hermansen et al. (2025) demonstrate that wage penalties are driven less by unequal pay for identical work than by migrants' restricted access to high-wage occupations, pointing to systemic barriers in job allocation processes. This perspective aligns with Birgier, Lu and Cantalini (2025), who show that limited access to career ladders and wage-enhancing positions plays a decisive role in sustaining long-term earnings gaps. The prevalence of insecure and temporary employment further exacerbates these disparities by weakening migrants' bargaining power and embedding economic vulnerability within employment relations. As Khattab (2025) argues, these mechanisms are intensified through intersecting dimensions of ethnicity, religion and gender, transforming wage inequality into a broader process of social exclusion rather than a purely economic outcome. Taken together, these findings suggest that wage inequality should be conceptualized as a manifestation of structural disadvantage rooted in institutional arrangements and segmented labour market dynamics.

Closely connected to wage inequality, the literature also highlights the persistent problem of underemployment and skill mismatch among migrants, particularly those with high levels of education. Frodermann et al. (2025) show that highly educated migrants frequently experience occupational downgrading, which not only depresses their income trajectories but also undermines long-term job satisfaction and professional identity. Comparative evidence from 17 Western European countries confirms that migrants face systematically higher risks of underemployment than native workers, with significant cross-national variation linked to the strength of education–employment matching institutions, as demonstrated by Birgier et al. (2023). These findings challenge explanations based on individual inadequacy and instead underscore the role of institutional constraints and segmented opportunity structures. Similarly, Tanrıkulu (2021) finds that while migrants often succeed in entering host-country labour markets quantitatively, they encounter pronounced qualitative barriers to employment aligned with their education and skills. Underemployment, particularly in the form of overqualification and skill mismatch, leads to the concentration of migrant labour in secondary labour market segments, thereby limiting upward mobility and social integration. In this respect,

underemployment operates not only as an economic inefficiency but also as a mechanism that reproduces structural inequality and constrains migrants' long-term integration prospects.

6. Conclusion

The primary objective of this study is to identify and prioritize the most critical problems faced by migrants in host countries by adopting a comprehensive and systematic analytical perspective. To achieve this aim, a novel fuzzy multi criteria decision making framework is proposed, integrating a distance-based experts' weighting approach, the COWEB technique for criteria weighting, and behavioral leadership fuzzy sets to better capture expert heterogeneity and judgment behavior. Based on evaluations obtained from ten experts across fourteen criteria, the analysis results reveal that labor market related challenges, particularly wage inequality and underemployment, constitute the most critical problems experienced by migrants. Robustness and validation analyses conducted through comparative methods, correlation tests, and scenario-based sensitivity analyses further confirm the stability and reliability of the findings. From a theoretical perspective, this study contributes to the migration literature by addressing an important missing gap related to the comparative prioritization of migrant problems and by introducing original methodological components that enhance analytical rigor and policy relevance.

Despite its contributions, this study is subject to several theoretical and methodological limitations. First, the proposed model relies on expert-based evaluations, which, although systematically structured, may still reflect context specific perspectives and normative assumptions. Second, the model is applied within a predefined set of criteria, and the prioritization outcomes may vary if alternative problem dimensions or country specific indicators are considered. In addition, the behavioral leadership fuzzy sets and the COWEB technique, while offering methodological originality, require further empirical applications to test their generalizability across different domains and datasets. Future studies may address these limitations by expanding the expert pool, incorporating longitudinal data, and applying the proposed framework to different migration contexts or policy environments. Moreover, integrating quantitative indicators alongside expert judgments and comparing the proposed model with a broader range of decision-making techniques may further strengthen its theoretical robustness and practical applicability.

Funding Statement: The authors do not have any fundings.

Ethical Statement: Not applicable.

Clinical Trial Number: Not applicable.

References

Aigner, P., Bešić, A., Kubiciel-Lodzińska, S., Bacher, J., Maj, J., & Prischl, C. (2025). The drivers of deskilling: Comparing highly skilled Ukrainian refugee women in Austria and Poland. International Migration, 63, e13363.

Amin, R. M. (2024). Later life employment: Benefits and challenges experienced by older immigrants from Sub-Saharan Africa living in Georgia. Journal of Elder Policy.

Banerjee, R., Lamb, D., & Lam, L. (2024). Use it or lose it: The problem of labour underutilization among immigrant workers in Canada. Industrial Relations Journal, 55, 378–397.

Buch, T., Burkert, C., Hell, S., Niebuhr, A., & Haas, A. (2025). Do xenophobic attitudes influence migrant workers' regional location choice? PLOS ONE, 20(2), e0316627.

Buzarov, A. (2023). Tendencies of adaptation and integration of immigrants from Ukraine in the European Union after the aggression of the Russian Federation against Ukraine. Baltic Journal of Economic Studies, 9(2), 73–90.

Cabieses, B., Belo, K., Calderón, A. C., Rada, I., Rojas, K., Araoz, C., & Knipper, M. (2024). The impact of stigma and discrimination-based narratives in the health of migrants in Latin America and the Caribbean: A scoping review. Lancet Regional Health – Americas, 40, 100660.

Chen, A. S. (2024). Study on teaching practices of multicultural competences: Fostering a cultural connection between new immigrant females and undergraduate students. International Journal of Intercultural Relations, 100, 101968.

Choi, S., & Kang, E. (2025). Cultural factors related to immigrants' health: A scoping review. Frontiers in Public Health, 13, 1606772.

Cotterell, N., Buffel, T., Nazroo, J., & Qualter, P. (2025). Loneliness among older ethnic minority people: Exploring the role of structural disadvantage and place using a co-research methodology. Ethnic and Racial Studies, 48(1), 206–228.

Della Rocca, B., Di Vincenzo, M., Giallanella, D., Gaggiano, C., Martinelli, F., Ricci, F., Sampogna, G., Luciano, M., Ventriglio, A., Bellomo, A., & Fiorillo, A. (2025). Acculturation stress and mental health outcomes in a sample of migrant inpatients: Findings from a naturalistic study. International Journal of Social Psychiatry, 71(2), 328–337.

Deng, Y., & Rose, T. (2025). Examining dimensions of help-seeking intentions and associations with personal mental illness stigma among racial and ethnic minority immigrants. Journal of Community Psychology, 53(2), e23154.

Efremov, A. (2025). Psychiatry in the context of changing cultural norms: Mental disorders among migrants and refugees. Journal of Behavioral and Cognitive Therapy, 35(4), 100544.

Eti, S., Karaman, F., Yüksel, S., Dinçer, H., & Yaylalı, İ. (2025). Introducing the comparative weighting evaluation based on the best criteria method: a multi-fuzzy framework for aviation fuel efficiency. *Scientific Reports*.

Fadhlia, T. N., Doosje, B., & Sauter, D. A. (2025). The socio-ecological factors associated with mental health problems and resilience in refugees: A systematic scoping review. Trauma, Violence, & Abuse, 26(3), 598–616.

Gaweł, A., Mroczek-Dąbrowska, K., Kania, A., & Bednár, R. (2025). Drivers of entrepreneurial activities among new-coming Ukrainian female refugees in Poland. Population, Space and Place, 31, e70059.

Ghadi, N., Gyan, C., Kikulwe, D., Massing, C., & Giesbrecht, C. J. (2023). Labour market integration of newcomers to Canada: The perspectives of newcomers in a smaller urban centre. International Migration, 61, 133–154.

Gheorghiev, O. (2025). From 'migrant' to 'refugee': What changed? Working lives of Ukrainian women in the Czech Republic. Journal of Ethnic and Migration Studies, 51(17), 4524–4541.

Han, J., & Hermansen, A. S. (2024). Wage disparities across immigrant generations: Education, segregation, or unequal pay? Industrial and Labor Relations Review, 77(4), 598–625.

Henríquez, D., Caqueo-Urízar, A., Urzúa, A., & Barahona, J. F. (2024). Suicidal ideation in migrant children and preadolescents and its relation to discrimination and contextual problems. International Journal of Psychological Research, 18(1), 30–38.

Hermansen, A. S., Penner, A., Boza, I., Elvira, M. M., Godechot, O., Hällsten, M., ... & Vickstrom, E. (2025). Immigrant–native pay gap driven by lack of access to high-paying jobs. *Nature*, *644*(8078), 969-975.

Hermansen, A. S., Penner, A., Boza, I., et al. (2025). Immigrant–native pay gap driven by lack of access to high-paying jobs. Nature, 644, 969–975.

Iqbal, K., Hongcheng, S., & Liang, H. (2024). A challenge in access to social services of undocumented Afghan immigrants in host society of Peshawar, Pakistan. *Discover Global Society*, *2*(1), 81.

Joshi, M., Finney, N., & Hale, J. M. (2025). Ethical loneliness and the undermining of social capital: How racism shapes loneliness in three UK Asian communities – A mixed methods study. Journal of Ethnic and Migration Studies, 51(19), 4901–4926.

Karagiannis, R., & Karagiannis, G. (2025). Distance-based weighting methods for composite indicators, with applications related to energy sustainability. *International Transactions in Operational Research*, *32*(1), 478-501.

Khattab, N. (2025). Not one 'Muslim penalty': ethnic, religious, and gendered variations in precarious work in the UK. *Journal of Ethnic and Migration Studies*, 1-23.

Khor, H. W., El Hajj, M., Sam, D. L., & Moland, K. M. (2024). "I felt so small": A qualitative study of migrant nursing assistants' experiences in Norway. Scandinavian Journal of Caring Sciences, 38, 996–1004.

Kollias, A., Kountouri, F., & Kalamanti, S. (2025). Framing migration through the crisis era 2015–2022: A content and semantic network analysis of the Greek press. Journalism and Media, 6(1), 4.

Kosic, A. (2025). Individual factors in acculturation: An overview of key dimensions. Behavioral Sciences, 15(6), 827.

Lazarova, M., Kilic, C., & Fitzsimmons, S. (2025). The invisible workforce: How can organizations leverage immigrant talent? Organizational Dynamics, 101148.

Lechner-Meichsner, F., Comtesse, H., & Olk, M. (2024). Prevalence, comorbidities, and factors associated with prolonged grief disorder, posttraumatic stress disorder and complex posttraumatic stress disorder in refugees: A systematic review. Conflict and Health, 18(1), 32.

Madsen, J., Jobson, L., Slewa-Younan, S., Mohammad, Y., Riman, I., Othman, L., & King, K. (2025). Arab Australian men's perspectives on mental health: Exploring beliefs about causes, help-seeking attitudes, and experiences. Psychology of Men & Masculinities, 26(4), 610–623.

Mahmud, B., & Soriano-Miras, R. M. (2025). The hell of the subcontract: Syrian refugees in Istanbul's clothing industry. Genealogy, 9(2), 55.

Mohammed, U. (2024). Caught in crises: Syrian refugees in Türkiye's labor market. International Journal of Migration, Health and Social Care, 20(2), 320–336.

Özaslan, A., Yildirim, M., Guney, E., İlhan, M. N., & Vostanis, P. (2024). Mental health problems and help-seeking behaviours of Syrian refugee adolescents: Mediating role of self-stigma. Psychological Medicine, 54, 732–741.

Ramos-Roure, F., Feijoo-Cid, M., Manresa-Dominguez, J. M., Segura-Bernal, J., García-Sierra, R., Fernández-Cano, M. I., Arreciado Marañón, A., Moreno-Gabriel, E., Flamarich Gol, C., & Toran-Monserrat, P. (2024). A comparative study of the perspectives of long-stay immigrants, nurses and cultural mediators on intercultural communication: A secondary qualitative analysis. Nursing Open, 11(11), e70074.

Sedacca, N. (2024). Migrant work, gender and the hostile environment: A human rights analysis. Industrial Law Journal, 53(1), 63–93.

Soare, S., & Gherghina, S. (2024). The political participation and representation of migrants: An overview. Politics and Governance, 12, Article 8089.

Tanrıkulu, F. (2021). The political economy of migration and integration: Effects of immigrants on the economy in Turkey. *Journal of Immigrant & Refugee Studies*, *19*(4), 364-377.

Tardivo, Z. M. (2025). Immigrant political participation across Western Europe: The role of political rights, public attitudes, and discrimination. Acta Politica, 1–25.

Tariq, H., Ali, Y., Sabir, M., Garai-Fodor, M., & Csiszárik-Kocsir, Á. (2024). Barriers to entrepreneurial refugees' integration into host countries: A case of Afghan refugees. Sustainability, 16(6), 2281.

Tomren, J. F., & Opaas, M. (2024). Adult refugees' perspectives on the impact of trauma and post-migration hardships on learning. European Journal of Psychotraumatology, 15(1), 2403249.

Tutic, A., Grehl, S., & Liebe, U. (2023). A Dual-Process Perspective on the Relationship between Implicit Attitudes and Discriminatory Behavior. *European Sociological Review*, 40(4), 672–685

Westbrook, M. (2023). "I don't have a pile of money to take care of things": Financial stress and housing insecurity among low-income Hispanic/Latinx immigrant families during COVID-19. Journal of Family and Economic Issues, 45, 315–326.

Yılmaz, E., Tamam, L., & Cengisiz, C. (2024). Post-traumatic stress disorder among long-term resettled Syrian refugees in Turkey: A comprehensive analysis of pre- and post-migratory factors. Frontiers in Psychiatry, 15, 1352288.

Zhang, X., Lu, X., Huang, C., Liu, W., & Wang, G. (2024). The impact of social capital on migrants' social integration: Evidence from China. Sustainability, 16(13), 556.