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Crossing borders without papers: how food insecurity fuels irregular migration in the MENA region

Réda Marakbi^{1*}  and Ogunmakin Oluwatobiloba Adedayo²

*Correspondence:

Réda Marakbi

reda.marakbi@univ-lille.fr

¹Univ. Artois, CNRS, IESEG School of Management, Univ. Lille, UMR 9221, Lille Economie Management (LEM), Arras, France

²University of Orléans, Orléans, France

Abstract

This paper examines how food insecurity shapes migration aspirations and their orientation toward irregular migration in the Middle East and North Africa. Using micro-data from the seventh wave of the Arab Barometer, we construct an experiential index of food insecurity and distinguish between overall migration aspirations and willingness to consider irregular migration among prospective migrants. Probit and sample-selection probit estimates show that food insecurity is positively associated with the probability of considering emigration and, conditional on having considered emigration, with willingness to migrate without the required papers. These findings suggest that food insecurity is related not only to the formation of migration aspirations, but also to the orientation of these aspirations toward irregular pathways among prospective migrants. The results remain robust across subsamples, alternative measures of food-insecurity intensity, and instrumental-variable probit specifications using Covid-related assistance as instruments for food insecurity. These findings suggest that development and humanitarian aid aimed at reducing food insecurity can play a critical role in mitigating irregular migration pressures and should be integrated into broader migration and development strategies.

Keywords Arab world, Food insecurity, Irregular migration

Introduction

Food insecurity is defined as a situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life (FAO, 2013). According to the Food and Agriculture Organization of the United Nations, 29.6% of the world's population was moderately or severely food insecure in 2022, corresponding to around 2.4 billion people worldwide (FAO, 2023b). The Covid-19 crisis and the war in Ukraine have greatly amplified the phenomenon, with 391 million more food-insecure people in 2022 than in 2019 (FAO, 2023b). However, these trends mask significant regional disparities. In the Arab world, food insecurity is higher than the global average, affecting 36.6% of the population, or around 170.1

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million people (FAO, 2023a). This represents an increase of 55% over 2010, before the region was hit by major shocks from the Arab springs, armed conflicts and the inflationary consequences of the Covid-19 crisis and the war in Ukraine.

Meanwhile, migration aspirations continued to be particularly high in Arab countries. According to the Arab Barometer survey conducted between 2018 and 2019, almost 30% of the Arab population aspire to migrate abroad (Dennison, 2022; El Hadri & Marakbi, 2025). Of these, more than a third declare to be prepared to migrate irregularly (Dennison, 2022; El Hadri & Marakbi, 2025). The Arab Barometer survey conducted between 2021 and 2022 reveals similar patterns (see below). These patterns show that the proportion of the Arab population aspiring to migrate is broadly similar to the proportion of the population affected by food insecurity. This raises the question of the impact of food insecurity on migration dynamics in general, and irregular migration dynamics in particular.

For a long time, the issue of food insecurity was largely absent from analyses of migration determinants. The first systematic attempts to link both phenomena emerged only in the past decade, initially focusing on internal migration. For instance, Crush (2013) shows that in Southern Africa, food insecurity pushes households from rural to urban areas, while Lindstrom et al. (2023) finds similar effects in Ethiopia. More recent work has examined international migration. Laborde et al. (2017) find no significant association between national hunger levels and international migration flows, but their aggregate approach masks the heterogeneity of individual experiences. In contrast, micro-level analyses such as Sadiddin et al. (2019) and Smith and Floro (2020) highlight that food insecurity substantially increases migration aspirations, though severe deprivation may constrain actual mobility. Some studies even suggest a non-linear, inverted-U relationship between food insecurity and migration (Smith & Wesselbaum, 2022), implying that only moderate levels of food insecurity increase the likelihood of migration.

However, the existing literature suffers from several limitations. In previous works, the form that migration takes under food stress remains uncertain. Notably, existing empirical studies never distinguish between regular and irregular migration. Most analyses focus on overall migration aspirations or actual flows, without disaggregating whether people imagine migration through regular channels or through irregular means. This distinction is important because food insecurity may not only increase the desire to leave, but also reshape the set of migration pathways perceived as feasible. Regular migration often requires financial resources, documentation, administrative procedures, waiting time, and access to institutional information, whereas irregular migration may appear more immediately accessible when regular pathways are perceived as out of reach. The question is therefore not only whether food insecurity increases migration aspirations, but also whether it changes the type of migration project that prospective migrants are willing to consider.

This paper contributes to the literature in three ways. First, we use individual-level data from the seventh wave of the Arab Barometer (2021–2022) to construct a food insecurity index based on self-reported experiences. Second, we explicitly distinguish between overall migration aspirations and willingness to consider irregular migration, offering new evidence on how food insecurity reshapes migration aspirations across regular and irregular pathways. Third, we estimate a sequential empirical framework that distinguishes between the formation of migration aspirations and the orientation of these

aspirations toward irregular migration among prospective migrants. We further assess the robustness of the results across subsamples, alternative measures of food-insecurity intensity, and instrumental-variable probit specifications using Covid-related assistance as instruments for food insecurity.

The remainder of the article is structured as follows. Section “[Literature](#)” reviews the relevant literature on food insecurity and migration. Section “[Theoretical framework: aspirations, capabilities, and migration pathways](#)” presents the theoretical framework. Section “[Data and stylized facts](#)” describes the data and presents descriptive statistics. Section “[Empirical strategy](#)” outlines the empirical methodology. Section “[Results](#)” reports the results. Section “[Concluding remarks](#)” concludes.

Literature

Over the past decade, a growing body of literature has examined how food insecurity influences migration dynamics. Yet the evidence remains conceptually fragmented and empirically inconclusive. Early work treated food insecurity as a background condition embedded within broader economic or environmental stress models, while more recent studies increasingly view it as an independent driver of migration behavior. This section synthesizes this literature into three main strands: (i) early empirical studies linking hunger, livelihoods, and migration; (ii) the emergence of micro-level analyses using experiential indicators of food insecurity and measures of individual migration aspirations; and (iii) the remaining theoretical and empirical gaps that motivate the present study.

Foundations and early works

Early studies rarely conceptualized food insecurity as a direct causal factor of migration. Instead, it appeared as one dimension of poverty or environmental vulnerability. Studies of climatic shocks, droughts, and harvest failures interpreted migration as an adaptive response to disrupted livelihoods. For instance, Gray and Mueller (2012) and Marchiori et al. (2012) linked rainfall variability to mobility in Sub-Saharan Africa, while Naudé (2010) and Baez et al. (2017) viewed migration as a household strategy to smooth consumption and income. These studies did not explicitly address food insecurity but examined livelihood and environmental shocks that directly affect food access. Their focus on household adaptation and vulnerability laid the conceptual foundations for later work that explicitly framed migration as a response to food insecurity.

Building on this structural perspective, a new strand of literature began to examine food insecurity more directly as a determinant of mobility. Crush (2013) was among the first to articulate food insecurity as a distinct driver of human migration. Drawing on the African Food Security Urban Network (AFSUN) surveys in eleven Southern African cities, he showed that food insecurity not only propels migration but also persists in destination areas, as urban migrants often experience higher rates of food deprivation than non-migrants. This evidence reframed migration as both a coping mechanism and a reproducer of vulnerability. In a similar spirit, Lindstrom et al. (2023) used longitudinal household data from southwest Ethiopia (2005–2008) and show that severe food insecurity and harvest failure increase both internal and international migration.

In contrast, macro-level investigations have produced more ambiguous results. Laborde et al. (2017), using cross-country data from 1990 to 2015, found no significant relationship between national indicators of undernourishment and international

migration once income levels were controlled for. Their findings highlight the limitations of aggregate data. Indeed, national measures of hunger and malnutrition may obscure the diverse, micro-level mechanisms through which food insecurity influences individual decisions to move.

Early contributions thus provided valuable insights but also yielded mixed conclusions about whether and how food insecurity drives migration. The heterogeneity in scale, methodology, and measurement has limited the comparability of results. Many studies rely on proxy indicators rather than standardized, experience-based measures of food insecurity. The inability of earlier studies to capture how deprivation is perceived and internalized gave rise to a new strand of the literature centered on the subjective experience of food insecurity. This perspective, operationalized through experiential measures such as the FIES, has redirected attention from livelihood adaptation to individual aspirations and intentions to migrate.

Micro-level evidence and migration aspirations

A second wave of research shifted the focus from observed migration to intentions and aspirations, taking advantage of new global survey instruments that measure food insecurity directly. Using the Food Insecurity Experience Scale (FIES) and migration aspirations data from the Gallup World Poll, Sadiddin et al. (2019) provided one of the first cross-country micro-level analyses linking food insecurity to migration aspirations. They found that food-insecure individuals were significantly more likely to express a desire to migrate internationally, confirming that the perception of food deprivation itself, rather than objective aggregates, serves as a strong motivational driver.

Expanding the scope, Smith and Floro (2020) analyzed ninety-four low- and middle-income countries and documented a robust positive relationship between household food insecurity and the likelihood to migrate. Their results indicated that this association holds across genders, although the intensity of the effect varies: men tend to respond more strongly to food insecurity, reflecting their greater social mobility in most contexts. Similarly, Smith and Floro (2020) and Smith and Wesselbaum (2022) combined FIES data with macroeconomic indicators and found that both moderate and severe food insecurity are associated with higher migration aspirations, though the strength of the relationship declines at very high levels of deprivation. These results suggest that while hunger is a clear push factor for migration aspirations, the magnitude of the effect is sensitive to context and severity.

Other studies have underscored how covariate shocks magnify this relationship. For example, Smith and Wesselbaum (2022) show that pandemics and other global crises intensify the aspiration to migrate among food-insecure populations, while Lindstrom et al. (2023) highlight the same pattern following poor harvests in Ethiopia. These findings stress that food insecurity generates strong migration aspirations even in the absence of immediate mobility opportunities.

The neglected question of migration pathways and other gaps in the literature

While there is now clear evidence that food insecurity fuels migration aspirations, almost no research investigated whether it also shapes the type of migration envisioned. Most empirical studies collapse all migration aspirations into a single binary indicator (“want to migrate” versus “not”) ignoring the diversity of migration pathways available.

Yet it seems reasonable to postulate that under conditions of food stress, individuals may perceive irregular migration as relatively more feasible than regular migration. Regular migration involves administrative barriers, waiting periods, and up-front fees. On the other hand, irregular migration, although riskier, may be more immediately accessible when liquidity and time are scarce.

Beyond the question of migration pathways, three additional gaps motivate the present study. *First*, the theoretical link between food insecurity and migration aspirations remains underdeveloped. Food insecurity is often treated as a material push factor, but less attention has been paid to the distinction between the desire to leave and the capability to transform this desire into a feasible migration project. *Second*, existing studies generally treat migration aspirations as a single outcome, without separating the formation of migration aspirations from the type of pathway that prospective migrants are willing to consider. This is an important limitation because food insecurity may operate at two distinct margins. It may increase the subjective desirability of leaving, while also constraining access to the financial, administrative, informational, and documentary resources required for regular migration. *Third*, the empirical evidence remains geographically uneven. Much of the micro-level literature has focused on sub-Saharan Africa or broad cross-country samples (Crush, 2013; Sadiddin et al., 2019; Lindstrom et al., 2023), while the MENA region remains comparatively understudied.

Theoretical framework: aspirations, capabilities, and migration pathways

We analyze the relationship between food insecurity and migration aspirations within the aspirations–capabilities framework of migration (Carling, 2002; Carling & Schewel, 2018; De Haas, 2021). In this perspective, migration is not the mechanical outcome of deprivation. It emerges from the interaction between the aspiration to leave and the capability to transform this aspiration into a feasible migration project. Aspirations capture the perceived desirability of migration relative to staying, while capabilities refer to the material, informational, social, legal, and institutional conditions that make mobility possible. Migration aspirations can therefore translate into behavior only when the desire to leave is matched by sufficient capabilities and by migration pathways that appear practically attainable.

Food insecurity can affect migration aspirations by altering the perceived value of staying. When individuals face difficulties securing basic food needs, remaining in place may become associated with greater material vulnerability, uncertainty, and declining expectations about the future. Consistent with recent evidence linking food insecurity to migration aspirations and mobility responses, food insecurity may therefore increase the subjective desirability of exit (Sadiddin et al., 2019; Smith & Floro, 2020; Smith & Wesselbaum, 2022; Lindstrom et al., 2023). In this sense, food insecurity operates on the aspiration margin: it raises the likelihood that individuals imagine migration as a possible response to deteriorating living conditions.

However, migration aspirations are not formed independently of perceived feasibility. Migration emerges at the intersection of aspirations, capabilities, and perceived opportunity structures: individuals assess not only the desirability of leaving, but also whether migration appears practically attainable (Carling & Schewel, 2018; De Haas, 2021). In this context, this implies that prospective migrants may evaluate regular and irregular pathways differently, depending on the resources and constraints associated with each

route. This distinction is particularly important in the MENA region, where recent evidence shows that the determinants of regular and irregular migration aspirations are not identical, and that economic resources can shape whether prospective migrants consider regular or irregular pathways (Dennison, 2022; Restelli, 2023). Regular migration generally requires financial resources, documentation, administrative procedures, waiting time, and access to institutional information. These requirements may become harder to satisfy under acute food insecurity. By contrast, irregular migration, although riskier and potentially more costly in the long run, may be perceived as less dependent on formal administrative requirements and therefore more immediately accessible when regular pathways appear out of reach.

Food insecurity may therefore reshape not only the level of migration aspirations, but also their composition. It can simultaneously increase the desire to leave and compress the set of migration pathways perceived as feasible. Under such conditions, irregular migration aspirations need not reflect a preference for illegality or a greater intrinsic taste for risk. They may instead express a constrained reorientation of migration projects when regular mobility requires capabilities that food-insecure individuals are less able to mobilize. The central implication is that food insecurity should not be understood only as a driver of migration pressure, but also as a force that reshapes the opportunity set within which migration pathways are imagined.

Data and stylized facts

Our empirical analysis draws on the seventh wave of the Arab Barometer, a large cross-national public opinion survey conducted in 2021–2022 across the Middle East and North Africa (MENA). The Arab Barometer is a reputable, academically coordinated project that provides nationally representative samples of adult populations in the Arab region. Wave VII was implemented between October 2021 and July 2022 in twelve countries: Algeria, Tunisia, Libya, Morocco, Mauritania, Egypt, Sudan, Jordan, Lebanon, Palestine, Iraq, and Kuwait.

The survey employed a stratified multi-stage probability design to ensure representativeness across regions, urban and rural areas, gender, and age groups. In total, more than 26,000 adults (aged 18 and above) were interviewed face-to-face by trained enumerators. Local institutions administered the questionnaire under the supervision of the Arab Barometer central team. Sampling weights provided in the dataset adjust for design effects and ensure national representativeness.

Measuring food insecurity

The Arab Barometer measures food insecurity through direct experience-based questions about recent difficulties in accessing sufficient food. Respondents were asked whether, over the past 30 days, the following situations had occurred:

1. “We worried our food would run out before we got money to buy more.”
2. “The food that we bought did not last, and we did not have money to get more.”

Each question captures a key dimension of food insecurity—respectively, anxiety about running out of food and the actual inability to afford more food. These items correspond to the “access” component of the FAO’s definition of food security and closely resemble items used in the Household Food Insecurity Access Scale (HFIAS). Respondents

answered on an ordinal scale (often, sometimes, rarely, never). For our analysis, these responses are treated as categorical indicators of food-related stress, with higher frequencies reflecting greater household insecurity.

We combine the two items into a composite Food Insecurity Index using correspondence analysis. The logic is that both questions capture related manifestations of the same underlying condition—namely household food insecurity. Rather than assigning arbitrary weights or relying on a single item, correspondence analysis applied to the cross-tabulation of the two food-insecurity items identifies the main dimension of association between their response categories, yielding a continuous indicator of experienced food insecurity.

Formally, let x_{i1} denote the response category chosen by individual i for the first item and x_{i2} the response category chosen for the second item. Correspondence analysis assigns coordinates to the row and column categories on the first factorial dimension. Let $a_{x_{i1}}$ denote the coordinate of the category selected by individual i on the first item, and let $b_{x_{i2}}$ denote the coordinate of the category selected on the second item. We define F_i as the individual food-insecurity score obtained from the coordinates of the two selected categories:

$$F_i = \frac{1}{2} (a_{x_{i1}} + b_{x_{i2}}). \quad (1)$$

The first factorial dimension is interpreted as the latent gradient of experienced food insecurity. Categories corresponding to more frequent food-related difficulties are located at the high end of the dimension, while categories corresponding to no reported difficulty are located at the low end.

For descriptive purposes, the index is normalized to range from 0 to 100 using min–max scaling:

$$FI_i = 100 \times \frac{F_i - \min(F_i)}{\max(F_i) - \min(F_i)}. \quad (2)$$

Higher values indicate more severe food insecurity. This approach preserves relative variation across households and aligns with the experiential logic of the FAO's Food Insecurity Experience Scale (FIES).

Although the measure relies on only two questions, it has important advantages: the items are direct, experiential, and easily comparable across individuals. They likely capture the lived experience of food stress more accurately than aggregate indicators such as calorie availability or GDP per capita. Nevertheless, three limitations should be noted. First, these questions primarily reflect financial access and anxiety about food shortages; they do not capture dietary quality or nutritional adequacy. Second, subjective interpretation may vary across households: what one household considers “running out of food” might differ from another's perception. Third, the questions capture short-term experiences and cannot fully reflect seasonal or chronic dimensions of food insecurity. Despite these limitations, these variables serve as reasonable and policy-relevant proxies to capture whether a household has struggled to afford sufficient food in recent times, which is the key concept of interest.

Table 1 The food insecurity indicator by country

	Statement 1 We worried our food would run out before we got money to buy more (%)			Statement 2 The food that we bought did not last and we did not have money to get more (%)			Food in- security indicator (average)
	Never	Sometimes	Often	Never	Sometimes	Often	
Algeria	52.19	39.47	8.34	66.32	21.53	12.15	29.34
Egypt	30.97	36.82	32.21	29.93	39.49	30.57	54.50
Iraq	38.14	27.68	34.19	42.30	26.20	31.50	49.52
Jordan	44.35	29.02	26.63	48.91	26.59	24.50	42.90
Kuwait	84.70	12.58	2.71	94.96	3.72	1.32	9.07
Lebanon	37.66	40.58	21.75	52.09	27.00	20.91	42.01
Libya	32.03	37.88	30.09	44.35	33.06	22.59	47.92
Mauritania	18.97	38.08	42.95	26.96	30.90	42.15	62.68
Morocco	41.65	40.85	17.50	67.39	22.68	9.94	33.55
Palestine	61.52	25.07	13.41	64.32	22.81	12.86	28.65
Sudan	30.28	38.91	30.81	35.20	35.52	29.28	52.44
Tunisia	42.07	25.70	32.23	44.44	27.13	28.43	46.87
Total	41.02	33.58	25.40	49.72	27.26	23.01	41.80

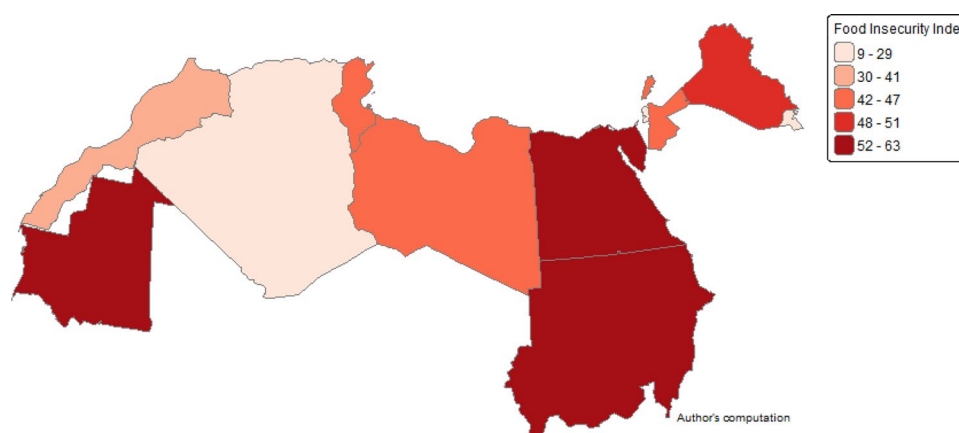
**Fig. 1** The food insecurity Index by country

Table 1 and Fig. 1 show that food insecurity remains a serious concern across the Arab world.¹ In the 30 days preceding the survey, almost half of respondents reported that the food they bought did not last and they lacked money to buy more, while nearly 60% feared running out of food. However, these averages mask substantial cross-country disparities. Kuwait reports near-zero levels of food insecurity, while in other countries, such as Mauritania, Egypt and Sudan, the average Food Insecurity Index is very high.

Migration data

The seventh wave of the Arab Barometer survey includes two questions capturing respondents' migration aspirations:

¹ The country-level values reported in Table 1 and Fig. 1 correspond to country-level averages of individual Food Insecurity Index scores. They are presented for descriptive purposes only. The Food Insecurity Index itself is constructed at the respondent level from each individual's answers to the food-insecurity items, so each respondent has a specific food-insecurity score. The empirical analysis relies on this individual-level variation and includes country fixed effects in all main specifications.

1. "Some people decide to leave their countries to live somewhere else. Have you ever thought about emigrating from your country?"
2. "Would you consider leaving your country even if you didn't have the required papers?"

The first question measures overall migration aspirations, while the second identifies willingness to migrate without the required papers. Based on these items, we construct two main dependent variables. First, we construct a binary variable equal to 1 for respondents who report having considered emigration and 0 otherwise. This variable captures overall migration aspirations. Second, among respondents who report having considered emigration, we construct a binary variable equal to 1 for prospective migrants who report being willing to migrate without the required papers and 0 otherwise. This variable captures the orientation of migration aspirations toward an irregular pathway among prospective migrants. This measurement strategy allows us to distinguish between two related outcomes: whether individuals consider emigration at all, and whether those who consider emigration are willing to contemplate an irregular route.

Figures 2 and 3 show that, as with food insecurity, both overall and irregular aspirations represent a major phenomenon in the Arab world. Specifically, over one in ten adults express a desire to migrate without the required papers. This magnitude is broadly consistent with previous survey waves (Dennison, 2022), suggesting that irregular migration aspirations are a structurally persistent feature of regional mobility dynamics. Compared to overall migration aspirations, this implies that more than one-third of potential migrants would consider irregular routes. However, this proportion varies considerably between countries: Egypt, Iraq, and Mauritania display relatively low rates of irregular migration aspirations, whereas Morocco, Sudan, and Tunisia record rates exceeding 15%.

Control variables

The empirical analysis includes a broad set of control variables capturing respondents' socio-demographic characteristics, household economic conditions, cultural orientations, and perceptions of the broader institutional environment. At the individual level, we control for age, gender, employment status, education, marital status, and place of

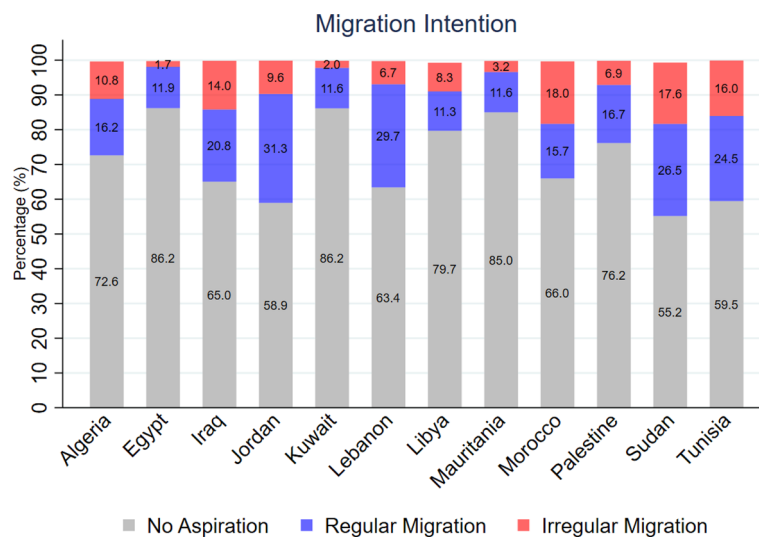
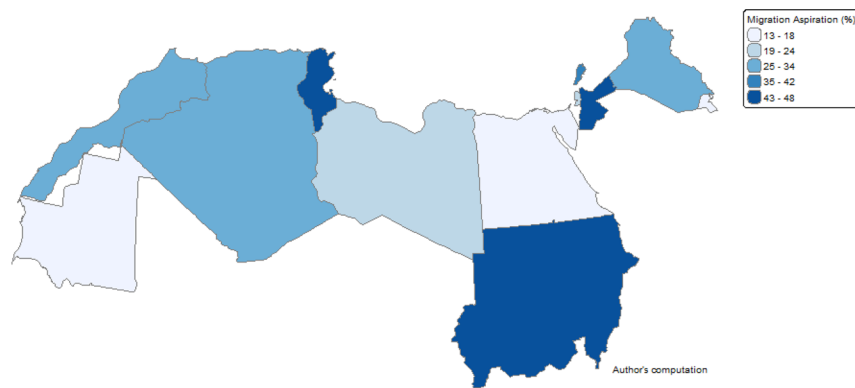
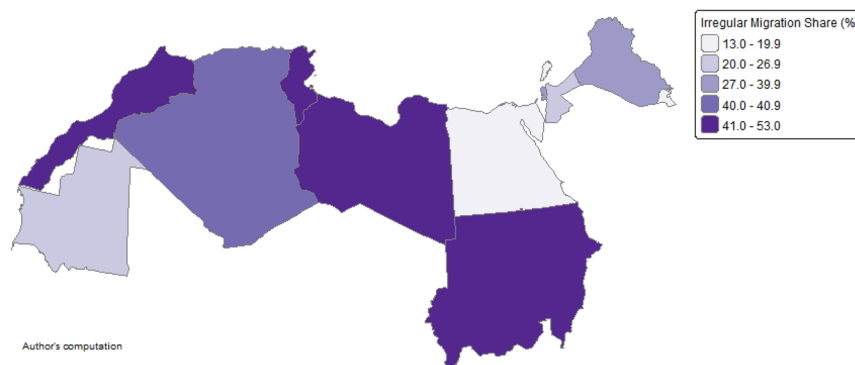


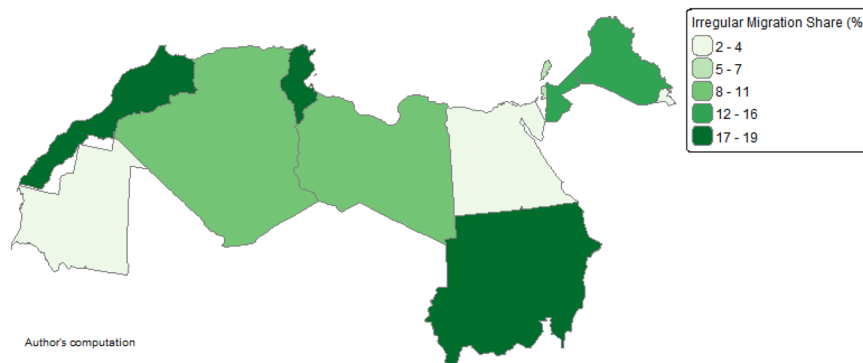
Fig. 2 Migration aspirations by country



(a) Overall migration aspirations



(b) Irregular migration aspirations among aspiring migrants



(c) Irregular migration aspirations among total population

Fig. 3 Migration aspirations maps

residence. Younger individuals are generally more likely to express migration aspirations than older ones (Migali & Scipioni, 2019), while men often report stronger migration intentions than women (Chort, 2014). Education is commonly associated with greater migration aspirations, although its relationship may differ across regular and irregular pathways (Dennison, 2022). Employment status may operate in opposite directions: employment can ease liquidity constraints and facilitate migration, but it can also reduce migration incentives by providing greater economic stability. Marital status is also relevant, as being married or partnered is often associated with lower mobility intentions

(Migali & Scipioni, 2019). Place of residence is included because rural and urban respondents may face different economic opportunities, mobility constraints, and migration costs (Epstein & Gang, 2006). We also control for religiosity, as previous work suggests that religiosity may shape migration aspirations in the MENA region through its effects on values, norms, and individual life orientations (El Hadri & Marakbi, 2025).

To account more directly for respondents' material conditions, we include two income-related variables: the monthly household income² and perceived household income³. The first captures the objective economic resources available to the household, while the second reflects respondents' subjective assessment of their economic position. Including both variables allows us to distinguish the effect of food insecurity from broader income and pocketbook considerations that may independently shape migration aspirations. This is particularly important in light of previous work showing that income may affect not only the propensity to migrate, but also the type of migration pathway envisaged (Restelli, 2023).

Beyond household characteristics, we further control for perceived corruption and trust in government institutions. These variables capture broader evaluations of governance and institutional responsiveness, which may influence migration aspirations through perceived injustice or declining confidence in the state's capacity to provide protection and opportunity (Bartram, 2013; Ariu et al., 2016; Helbling & Morgenstern, 2023). In all specifications, we also include country fixed effects to absorb time-invariant cross-country differences across the MENA region. Table 2 reports descriptive statistics for all control variables.

Climate change is also an important contextual factor in the MENA region and may confound the relationship between food insecurity and migration aspirations (World Bank, 2022). Climate-related shocks may affect food insecurity through agricultural productivity, food prices, water scarcity, and household income. At the same time, they may also shape migration aspirations directly by deteriorating livelihood prospects, increasing uncertainty, and altering expectations about the future. Climate change may therefore influence both the main explanatory variable and the outcome of interest.

Our empirical strategy mitigates part of this concern by including country fixed effects, residence type, household income, income perception, and a rich set of individual-level socio-demographic and political controls. These variables absorb part of the cross-country and individual-level heterogeneity that may be correlated with climate vulnerability. However, the Arab Barometer does not provide harmonized measures of localized exposure to climate shocks across all countries in the sample. We therefore cannot directly estimate the role of climate shocks in this paper. The results should consequently be interpreted as conditional associations between individual-level food insecurity and migration aspirations, while acknowledging that unobserved subnational climate exposure may remain a source of residual contextual confounding.

²Monthly household income was converted into current U.S. dollars to ensure cross-country comparability across respondents reporting income in national currencies. To reduce skewness and limit the influence of extreme values, the income variable was then transformed using the natural logarithm of one plus income.

³This variable has four ordered categories: able to save, able to cover expenses without notable difficulties, facing some difficulties, and facing significant difficulties. Because these categories follow a clear ordinal structure, we include perceived household income as an ordinal control in the regression models. The results are substantively unchanged when perceived income is instead entered as a set of categorical indicators.

Table 2 Descriptive statistics by migration aspiration status

	All population	Overall migration aspirations	Irregular migration aspirations
Number of observations	14,010	4,560	1,539
Age – Mean (SD)	39.01 (14.36)	34.65 (12.50)	33.25 (11.42)
Monthly income – Mean (SD)	1148.71 (2503.08)	1165.42 (2977.09)	740.56 (1955.30)
Gender (%)			
Male	50.3	56.6	66.7
Female	49.7	43.4	33.3
Residence type (%)			
Urban	67.8	71.7	68.9
Rural	29.9	26.5	29.2
Camp	2.2	1.8	1.9
Employment status (%)			
Employed	39.9	41.1	43.2
Inactive	36.9	26.6	19.6
Student	10.8	14.5	13.1
Unemployed	12.4	17.8	24.1
Education level (%)			
No education	6.8	4.3	6.2
Primary	31.2	26.9	30.3
Secondary	39.8	41.5	41.1
Tertiary	22.2	27.3	22.4
Marital status (%)			
Not married	38.7	48.0	54.6
Married/Partnered	61.3	52.0	45.4
Perceived corruption (%)			
To a large extent	65.4	75.1	75.8
To a medium extent	24.9	18.9	17.3
To a small extent	7.3	4.8	5.7
Not at all	2.5	1.2	1.2
Religiosity (%)			
Not religious	11.6	14.7	18.8
Somewhat religious	44.6	50.7	47.5
Very religious	43.8	34.6	33.7
Income perception (%)			
Able to save	9.4	8.3	7.9
Without difficulty	24.6	22.3	21.6
Some difficulty	37.8	39.0	41.1
Significant difficulty	28.2	30.3	29.4
Trust in government (%)			
A great deal of trust	8.4	6.5	6.6
Quite a lot of trust	22.1	17.9	16.3
Not a lot of trust	22.7	19.6	20.1
No trust at all	46.9	56.1	56.9

Notes: Statistics are reported for the full population, respondents with overall migration aspirations, and respondents with irregular migration aspirations. Continuous variables are reported as means with standard deviations in parentheses. Categorical variables are reported as percentages by category

Empirical strategy

Our empirical analysis proceeds in two main steps. First, we estimate baseline probit models to examine the population-level association between food insecurity and migration aspirations. Second, we estimate a sequential sample-selection probit model that

distinguishes between the formation of migration aspirations and, among prospective migrants, willingness to consider irregular migration.

Baseline population-level probit models

We begin with binary probit models relating food insecurity to migration aspirations at the population level. Two dependent variables are considered. The first is overall migration aspirations, coded 1 if the respondent reports having considered emigration and 0 otherwise. The second is a population-level indicator of irregular migration aspirations, coded 1 if the respondent both reports having considered emigration and declares willingness to consider leaving without the required papers, and 0 otherwise.

This second outcome is useful because it captures the unconditional probability that an individual in the full population both considers emigration and is willing to contemplate an irregular route. However, it combines two analytically distinct margins: the formation of migration aspirations and the willingness to consider irregular migration among those who have such aspirations. It is therefore interpreted as a baseline population-level indicator. The sequential selection model presented below is used to distinguish these two margins explicitly.

Formally, the probability that individual i reports migration aspirations of type j ($j \in \{\text{overall, irregular}\}$) is modeled as:

$$\Pr(y_{j,i} = 1 \mid X_i, \mu_c) = \Phi(\beta_0 + \beta_1 FI_i + \beta'_2 X_i + \mu_c), \quad (3)$$

where $\Phi(\cdot)$ is the cumulative distribution function of the standard normal distribution, FI_i denotes the Food Insecurity Index for individual i , X_i is the vector of control variables discussed above, and μ_c represents country fixed effects.

The coefficient β_1 captures the conditional association between food insecurity and the probability of reporting migration aspirations of type j . In the first specification, this corresponds to overall migration aspirations. In the second, it corresponds to population-level irregular migration aspirations, that is, the probability of both considering emigration and being willing to consider leaving without the required papers.

To allow for non-linearity in the relationship between food insecurity and migration aspirations, we also estimate specifications including a squared term for the Food Insecurity Index:

$$\Pr(y_{j,i} = 1 \mid X_i, \mu_c) = \Phi(\alpha + \beta_1 FI_i + \beta_2 FI_i^2 + X'_i \gamma + \mu_c). \quad (4)$$

A sequential selection model of migration aspirations

The baseline probit models provide useful population-level evidence, but they do not fully reflect the sequential structure of the Arab Barometer questionnaire. The question on irregular migration is asked only to respondents who report having considered emigration. We therefore turn to a sequential sample-selection probit model, which constitutes the central empirical framework of the paper.

This framework distinguishes between two stages of the migration process. The first stage concerns the formation of overall migration aspirations. The second stage concerns, among prospective migrants, whether these aspirations are oriented toward an irregular route.

The selection equation models the probability that respondent i reports overall migration aspirations:

$$A_i^* = \alpha_0 + \alpha_1 FI_i + \alpha_2' X_i + \mu_c + u_i, \quad (5)$$

with

$$A_i = \begin{cases} 1 & \text{if } A_i^* > 0, \\ 0 & \text{otherwise,} \end{cases} \quad (6)$$

where $A_i = 1$ denotes overall migration aspirations, FI_i is the Food Insecurity Index, X_i is the vector of individual-level controls, and μ_c denotes country fixed effects.

The outcome equation models, conditional on expressing migration aspirations ($A_i = 1$), willingness to consider irregular migration:

$$I_i^* = \gamma_0 + \gamma_1 FI_i + \gamma_2' X_i + \mu_c + v_i, \quad (7)$$

with

$$I_i = \begin{cases} 1 & \text{if } I_i^* > 0 \text{ and } A_i = 1, \\ 0 & \text{if } I_i^* \leq 0 \text{ and } A_i = 1. \end{cases} \quad (8)$$

Here, $I_i = 1$ denotes willingness to consider leaving without the required papers among respondents who report having considered emigration. The outcome equation is therefore observed only among prospective migrants, while the selection equation models entry into this group.

The disturbances (u_i, v_i) are assumed to follow a bivariate normal distribution with zero means, unit variances, and correlation coefficient ρ :

$$\begin{pmatrix} u_i \\ v_i \end{pmatrix} \sim \mathcal{N} \left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix} \right]. \quad (9)$$

The model is estimated by maximum likelihood. The parameter ρ captures the correlation between unobserved determinants of overall migration aspirations and willingness to consider irregular migration among prospective migrants. A non-zero value of ρ indicates that the two stages are not independent, supporting the use of a joint sequential specification.

In additional specifications, we allow the relationship between food insecurity and migration aspirations to be nonlinear by including both the Food Insecurity Index and its squared term in the selection and outcome equations.

Results

Baseline probit estimates

Table 3 reports the baseline probit estimates. Columns (1) and (2) examine overall migration aspirations, while columns (3) and (4) examine the population-level indicator of irregular migration aspirations.

Across all specifications, the Food Insecurity Index is positively and statistically significantly associated with migration aspirations. In columns (1) and (2), higher food insecurity is associated with a higher probability of considering emigration. In columns (3) and (4), food insecurity is also positively associated with the population-level probability of irregular migration aspirations. In these probit specifications, the estimated association

Table 3 Baseline probit models

	Overall migration aspirations		Population-level irregular migration aspirations	
	Linear specification	Quadratic specification	Linear specification	Quadratic specification
Food Insecurity Index	0.320*** (0.035)	0.346*** (0.119)	0.419*** (0.045)	0.523*** (0.157)
FI Index Squared		−0.027 (0.118)		−0.106 (0.152)
Age of respondent	−0.021*** (0.001)	−0.021*** (0.001)	−0.019*** (0.001)	−0.019*** (0.001)
Gender (ref = female)	−0.198*** (0.028)	−0.198*** (0.028)	−0.395*** (0.038)	−0.395*** (0.038)
<i>Residence type (ref: urban)</i>				
Rural	−0.179*** (0.027)	−0.179*** (0.027)	−0.106*** (0.035)	−0.106*** (0.035)
Camp	−0.085 (0.087)	−0.085 (0.087)	0.062 (0.115)	0.060 (0.115)
<i>Employment status (ref: employed)</i>				
Inactive	−0.166*** (0.035)	−0.166*** (0.035)	−0.110** (0.048)	−0.111** (0.048)
Student	−0.016 (0.043)	−0.017 (0.043)	−0.165*** (0.053)	−0.166*** (0.053)
Unemployed	0.175*** (0.039)	0.175*** (0.039)	0.227*** (0.046)	0.227*** (0.046)
<i>Education level (ref: no education)</i>				
Primary education	−0.096* (0.055)	−0.096* (0.055)	−0.226*** (0.069)	−0.226*** (0.069)
Secondary education	−0.014 (0.056)	−0.014 (0.056)	−0.216*** (0.070)	−0.216*** (0.070)
Tertiary education	0.161*** (0.059)	0.161*** (0.059)	−0.242*** (0.074)	−0.242*** (0.074)
<i>Marital status (ref: not married)</i>				
Married/Partnered	−0.093*** (0.028)	−0.093*** (0.028)	−0.127*** (0.037)	−0.127*** (0.037)
Corruption	−0.220*** (0.018)	−0.220*** (0.018)	−0.166*** (0.025)	−0.167*** (0.025)
Log household income	0.009 (0.010)	0.009 (0.010)	−0.131*** (0.031)	−0.131*** (0.037)
Income perception	0.043*** (0.014)	0.043*** (0.014)	0.016 (0.018)	0.016 (0.018)
Trust in government	0.092*** (0.013)	0.092*** (0.013)	0.116*** (0.017)	0.117*** (0.017)
Observations	14,010	14,010	14,010	14,010
Country FE	Yes	Yes	Yes	Yes

Notes: The table reports probit coefficients. Ordinal controls are coded so that higher values indicate greater perceived household-income difficulty, lower trust in government, and lower perceived corruption, respectively. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

appears stronger for the population-level irregular-migration outcome than for overall migration aspirations, suggesting that food insecurity is especially strongly related to the orientation of migration projects toward irregular pathways.

This pattern is consistent with the theoretical argument developed above. Food insecurity may increase the perceived desirability of leaving by making staying more uncertain and materially insecure. At the same time, it may constrain the resources,

Table 4 Food insecurity, emigration aspirations, and irregular migration: a two-stage selection model

	Linear specification		Quadratic specification	
	Irregular migration Outcome equation.	Overall migration Selection equation	Irregular migration Outcome equation	Overall migration Selection equation
Food Insecurity Index	0.359*** (0.064)	0.310*** (0.035)	0.502** (0.205)	0.310*** (0.035)
FI Index Squared			−0.146 (0.197)	−0.151 (0.198)
Age of respondent	−0.016*** (0.003)	−0.019*** (0.001)	−0.015*** (0.003)	−0.019*** (0.001)
Gender (ref = female)	−0.413*** (0.051)	−0.178*** (0.029)	−0.412*** (0.051)	−0.178*** (0.029)
<i>Residence type (ref: urban)</i>				
Rural	−0.042 (0.048)	−0.169*** (0.027)	−0.042 (0.048)	−0.169*** (0.027)
Camp	0.170 (0.155)	−0.083 (0.087)	0.169 (0.155)	−0.083 (0.087)
<i>Employment status (ref: employed)</i>				
Inactive	−0.053 (0.067)	−0.155*** (0.035)	−0.053 (0.067)	−0.155*** (0.035)
Student	−0.227*** (0.068)	−0.046 (0.044)	−0.229*** (0.068)	−0.046 (0.044)
Unemployed	0.234*** (0.058)	0.179*** (0.040)	0.234*** (0.059)	0.179*** (0.040)
<i>Education level (ref: no education)</i>				
Primary education	−0.320*** (0.104)	−0.094* (0.056)	−0.319*** (0.104)	−0.094* (0.056)
Secondary education	−0.379*** (0.106)	−0.013 (0.057)	−0.379*** (0.106)	−0.013 (0.057)
Tertiary education	−0.500*** (0.116)	0.152** (0.061)	−0.501*** (0.116)	0.151** (0.061)
<i>Marital status (ref: not married)</i>				
Married/Partnered	−0.098* (0.055)	−0.124*** (0.034)	−0.097* (0.055)	−0.124*** (0.034)
Previously married	0.045 (0.098)	−0.073 (0.054)	0.046 (0.098)	−0.073 (0.054)
Subjective religiosity	−0.104*** (0.034)	−0.126*** (0.019)	−0.103*** (0.034)	−0.126*** (0.019)
Corruption	−0.100** (0.041)	−0.220*** (0.019)	−0.100** (0.041)	−0.220*** (0.019)
Log household income	−0.129*** (0.037)	0.007 (0.010)	−0.163*** (0.016)	0.007 (0.048)
Income perception	0.001 (0.025)	0.045*** (0.014)	0.000 (0.025)	0.045*** (0.014)
Trust in government	0.121*** (0.023)	0.092*** (0.013)	0.121*** (0.023)	0.092*** (0.013)
Observations	13,871		13,871	
Selected observations	4,511		4,511	
Nonselected observations	9,360		9,360	
Country FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
ρ	0.305		0.301	

Table 4 (continued)

	Linear specification		Quadratic specification	
	Irregular migration Outcome equation.	Overall migration Selection equation	Irregular migration Outcome equation	Overall migration Selection equation
Wald test $p = 0$	3.80		3.78	
p -value	0.051		0.052	

Notes: The table reports estimates from sequential selection probit models. Ordinal controls are coded so that higher values indicate greater perceived household-income difficulty, lower trust in government, and lower perceived corruption, respectively. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

documentation, information, and administrative capacity required to pursue regular migration channels. Under such conditions, irregular migration may appear more conceivable among individuals whose migration aspirations are formed under severe subsistence constraints.

Columns (2) and (4) introduce a squared term for the Food Insecurity Index in order to assess whether the relationship is nonlinear. The squared coefficients are negative but statistically insignificant. These estimates therefore do not provide evidence of a clear inverted-U relationship or of a substantive reversal at high levels of food insecurity.

The control variables generally display patterns consistent with the migration literature. Age is negatively associated with migration aspirations, indicating that younger respondents are more likely to consider emigration. Being married or partnered is also associated with lower migration aspirations. Unemployment is positively associated with both overall and irregular migration aspirations, while education appears to have a differentiated relationship with the two outcomes: tertiary education is positively associated with overall migration aspirations but negatively associated with the population-level irregular migration outcome. This pattern is consistent with the idea that education may increase migration aspirations while also improving access to more regular migration pathways.

Overall, the baseline probit estimates provide initial population-level evidence that food insecurity is positively associated with migration aspirations and with the probability of considering irregular migration.

Food insecurity, migration aspirations, and irregular pathways: a sequential framework

The baseline probit estimates provide population-level evidence that food insecurity is positively associated with both overall migration aspirations and the probability of reporting irregular migration aspirations. However, the population-level indicator of irregular migration necessarily combines two distinct processes: first, whether individuals consider emigration at all; and second, among those who do, whether they are willing to consider leaving without the required papers. To distinguish these two margins more explicitly, we now turn to the sequential selection framework.

Table ?? reports estimates from the sequential selection probit model. Columns (1) and (2) report the linear specification, while columns (3) and (4) report the quadratic specification, including the Food Insecurity Index and its squared term in both the selection and outcome equations. Across both specifications, food insecurity is positively associated with the probability of considering emigration and, among prospective migrants, with willingness to consider irregular migration.

The estimates indicate that food insecurity is related to both stages of the migration process. In the selection equation, higher food insecurity is associated with a greater probability of forming migration aspirations. In the outcome equation, conditional on having considered emigration, food insecurity is also associated with a greater willingness to contemplate an irregular route.

The estimated correlation between the disturbances of the two equations is positive, and the Wald test of independence is marginally significant. This suggests that the two stages are not fully independent and that accounting for the sequential structure is appropriate. At the same time, the main substantive conclusion does not depend solely on the selection correction: food insecurity is positively associated with both the formation of migration aspirations and the orientation of these aspirations toward irregular pathways among prospective migrants.

Robustness checks

As a first robustness check, we examine whether the main relationship is driven by specific demographic or socio-economic groups. We re-estimate the sequential selection model across subsamples defined by gender, employment status, residence type, and education level. The results, reported in Appendix Table A1 show a stable pattern. In the selection equation, food insecurity is positively and significantly associated with overall migration aspirations in all subsamples. In the outcome equation, the coefficient on food insecurity is also positive across all subsamples and statistically significant in most of them. Overall, these results indicate that the association between food insecurity and irregular migration aspirations is not driven by a single population group, gender composition, labor-market status, residence type, or educational attainment.

Second, we examine whether the results are robust to an alternative modelling of food insecurity intensity. Instead of relying on the continuous Food Insecurity Index and its squared term, we divide respondents into quintiles of food insecurity and re-estimate the sequential selection model. The results, reported in Appendix Table A2, confirm the main findings. In the selection equation, the probability of considering emigration increases steadily across the food insecurity distribution. In the outcome equation, all quintiles above the lowest category are positively associated with irregular migration aspirations. The coefficients are largest in the intermediate-high part of the distribution and decline at the highest quintile, which is consistent with a positive relationship subject to diminishing marginal effects at the top of the food-insecurity distribution.

Third, we assess whether the results are robust to instrumental-variable probit specifications using Covid-related assistance as instruments for food insecurity. The rationale is that Covid food assistance was closely related to household vulnerability and short-term subsistence constraints during the pandemic, and is therefore expected to predict variation in food insecurity. The first-stage results confirm this relevance. At the same time, aid receipt may also affect migration aspirations through perceptions of social protection or institutional responsiveness. We mitigate part of this risk by including country fixed effects, residence type, objective household income, perceived income, and trust in government in the IV specification. Nevertheless, the exclusion restriction remains demanding, and the IV results should therefore be interpreted cautiously. As shown in Appendix Table A3, Covid food assistance is positively and significantly associated with

the Food Insecurity Index in the first stage. In the IV-probit specification, food insecurity remains positively associated with irregular migration aspirations.

Concluding remarks

This paper examined how food insecurity shapes migration aspirations and their orientation toward irregular migration in the MENA region. Using micro data from the seventh wave of the Arab Barometer (2021–2022), we find a positive relationship between food insecurity and migration aspirations. The sequential selection model further shows that food insecurity is positively associated with willingness to consider irregular migration among prospective migrants. The association appears stronger for irregular migration aspirations than for overall migration aspirations, suggesting that food insecurity may not only increase the desire to leave, but also affect the type of migration pathway that prospective migrants are willing to consider. The results remain robust when considering different subsamples and alternative measures of food-insecurity intensity, as well as in instrumental-variable probit specifications.

The study contributes to the literature by refining existing evidence on the relationship between food insecurity and migration. These results suggest that food-related deprivation is associated not only with a higher probability of considering emigration, but also with a greater willingness, among prospective migrants, to consider leaving without the required papers.

These findings have important policy implications. Improving food security and expanding social protection can reduce the livelihood pressures that lead individuals to consider irregular migration. In humanitarian and development settings, interventions that stabilize food access and smooth consumption over shocks should be viewed as part of a broader migration management strategy.

This study also opens several avenues for future research. First, the analysis focuses on migration aspirations rather than preparation or realized migration. Future work should investigate whether similar mechanisms hold for actual migration outcomes. Second, future research could combine survey data with more localized measures of economic, climatic, and institutional vulnerability in order to better capture the contextual forces that jointly shape food insecurity and migration aspirations. Third, applying the same framework to other regions would shed light on whether the relationship between food insecurity and irregular migration is context-specific or globally consistent.

Overall, the evidence indicates that food insecurity operates as a structural factor shaping migration aspirations and pathway orientation under constrained opportunities. Policies that combine food security interventions with accessible and credible regular migration channels may help reduce pressures for irregular migration in the region.

Supplementary information

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Supplementary Material 1

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Author contributions

All authors were equally involved in the writing of the paper.

Data availability

The data are publicly available: arabbarometer.org

Declarations**Competing interests**

The authors declare no competing interests.

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