

Food Insecurity, Gender, and International Migration

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Abstract

Migration has increasingly become an important strategy in meeting the basic needs of individuals in low- and middle-income countries. The determinants of migration have been widely studied but there is a notable lack of research on the relationship between food insecurity and migration. The objectives of this paper are two-fold: to examine the relationship between food insecurity and the migration intentions of potential movers from low- and middle-income countries, and to identify the factors that enable migration intentions to become migration decisions. We develop a two-stage analytical framework that first, demonstrates the relationship between food insecurity and migration intentions at the individual level and examines its gender dimension; and second, examines the factors that influence migration decisions using a household semi-cooperative model. We then empirically test whether food insecurity and gender, alongside individual, household, and country characteristics, influence an individual's international migration intentions and subsequent migration decision. The analyses involve a series of hierarchical linear and binary-choice models

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with sample-selection using data from the 2014-2015 waves of the Gallup World Poll, which includes the first global measure of individual-level food insecurity. The results, which are found to be robust, indicate that food insecurity is an important determinant of both migration intentions and migration decisions; where the likelihood of international migration intentions increases monotonically with the severity of food insecurity; and the likelihood of international migration decisions decreases with the severity of food insecurity. We also find that these relationships vary significantly by gender. These findings are especially relevant given that the rate of international migration over the last several decades has increased significantly, particularly with regards to female migration. These results inform governments and aid organizations in developing nutritional- and gender-aware migration policies and in meeting international development and migration-related targets, such as in the Sustainable Development Goals.

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Introduction

International migration has received much attention in the economics literature, since migration has become an increasingly important strategy in meeting the basic needs of people in the developing world. However, there is a paucity of research regarding the relationship between food insecurity and migration. Specifically, how an individual's food security status might affect his or her migration intentions and subsequent decisions. As the number of migrant workers rise to over 150 million (ILO, 2015), and the issue of food insecurity continues to be of major concern, examining this relationship may help governments meet their commitments to the 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs). Furthermore, although the global share of international migrants are increasingly women, the gender dimension of the migration decision is critically understudied (Gammage and Stevanovi, 2016). Understanding these relationships is essential when considering the implications of immigration policies and avoiding unintended consequences.

One reason why evidence of this relationship is missing is due to a lack of appropriate data for conducting empirical analyses. Until recently a common individual-level measure to study the impacts of food insecurity across countries was not available. In 2014, the Food and Agriculture Organization's (FAO) Voices of the Hungry project developed an experiential measure of food insecurity called the Food Insecurity Experience Scale (FIES), and contracted Gallup, Inc. for data collection in over 150 countries. This paper is among the first to utilize FAO's new experiential food insecurity data collected through the Gallup World Poll (GWP).¹ Along with the FIES measure, the GWP also provides unique information on migration behavior, as well as detailed

¹ For recent others, see FAO (2016), Frongillo et al. (2017), Smith et al. (2017a), and Smith et al. (2017b).

individual- and household-level characteristics of potential migrants around the world. This combined GWP-FIES dataset provides a unique opportunity to analyze the relationship between individual migration behavior (intentions and subsequent decisions) and food insecurity among low- and middle-income countries to address this serious gap in the literature.

This paper makes several contributions to the literature. First, we present a theoretical framework for understanding the relationship between food insecurity, international migration intentions, and subsequent migration decisions from a gendered perspective. This is done in a two-step manner. The relationship between food insecurity and migration intentions is first examined at the individual level. We demonstrate that the relationship between food insecurity and migration intentions may take different forms depending on the severity of the individual's food insecurity and the conditioning influence of other social and economic factors. We also show that the relationship between food insecurity and migration intentions depends crucially on social expectations based on gender. In the second step, we shift the focus from the behavior of the individual to the household decision-making process. Whether migration intentions lead to a migration decision depends on the household's support of the potential migrant's intention. Factors that influence migration intentions initially could be different from the conditions or factors that influence the migration decision. We take into account gender roles, household composition, and household resources that determine whether the individual is able to move forward towards international migration.

Second, we conduct empirical analyses to test if the relationship between food insecurity and migration behavior is statistically significant after controlling for other determinants of migration. If true, then the vast literature on the determinants of migration may regularly suffer from omitted variable bias, or at the very least be missing a crucial part of the migration decision.

Third, we also consider the possibility that the food insecurity-migration relationship differs by gender. A gender-sensitive empirical analysis provides a better understanding of the impact of socially ascribed roles and gender relations on an individual's migration behavior. This is important to understanding the current trends and patterns of international migration, but also how gender relations may lead to differential impacts on women and men when considering potential migration, particularly in their attempt to address the issue of food insecurity.

This paper uses data from the 2014 and 2015 waves of the GWP to empirically examine the relationship between food insecurity and international migration intentions and subsequent migration decisions, of both women and men from 90 low- and middle-income countries. Using a series of hierarchical linear and binary-choice models with sample-selection, we find that food insecurity is an important determinant of both international migration intentions and subsequent migration decisions. The likelihood of migration intentions increases monotonically with the severity of food insecurity; where the association between food insecurity and migration intentions is larger than for any other explanatory variable. For those who state a migration intention, the likelihood of a migration decision decreases with the severity of food insecurity. We also perform a series of robustness checks to account for possible endogeneity stemming from selection-bias due to political violence and natural disasters, and accounting for possible measurement error in the dependent variables (considering previous and temporary migrants). The results remain robust under alternative model specifications.

We then examine possible gendered differences regarding the relationship between food insecurity and migration behavior. To date, few studies have examined the gender dimension of migration decisions (Richter and Taylor, 2007) and none have examined the relationship between food insecurity and migration from a gendered perspective. We find that the determinants of

migration intentions and subsequent decisions differ significantly by gender, and that the socially ascribed roles and differential access to resources and employment opportunities between women and men critically influence the relationship between food insecurity and migration.

These findings are particularly relevant given that the rate of female migration over the last several decades has increased significantly. There are economic and welfare implications of this pattern for both migrants and their households. These results inform governments and aid organizations and help them meet their international development and migration-related targets. Results suggest the need for increased coordination between international food security and international migration policy agendas.

The paper is organized as follows: The next section gives a brief summary of the previous research on international migration and food insecurity, respectively. Section 3 presents the theoretical framework illustrating the relationship between food insecurity, gender, and migration behavior. Section 4 discusses the GWP data and variable construction for the analyses; section 5 discusses the econometric approach and robustness checks; and section 6 discusses the results and how they relate to the migration literature. Section 7 concludes.

Background

The determinants of international migration have been well documented in the economics literature, largely focusing around strategies for households to diversify their livelihoods and escape poor living conditions.² Conventional migration theories largely focus on either aggregate migration flows or on an individual's migration decision-making process. In the case of the latter, the migration decision is based on a simple cost-benefit assessment, where potential migrants

² While we focus on international migration in this paper, many of the determinants and decision processes discussed would apply to internal migration (e.g., rural to urban) as well.

decide to leave if the expected returns in the destination area is greater than the area of origin, or if the expected payoffs of moving exceed the costs (Harris and Todaro, 1970; Massey et al., 1993). We examine the migration decision-making process by disaggregating this process into two distinct stages: whether an individual intends to migrate or not (migration intentions) and whether the household supports the intention of its member, enabling the latter to make preparations for migration (subsequent migration decision). We define migration intentions as the desire to move internationally in the near future. We use whether an individual has made preparations to migrate (purchased an airline ticket, or applied for a visa) as proxy for migration decisions, due to lack of data in the GWP on whether an individual actually migrates. Thus, we assume that if an individual has purchased a ticket or applied for a visa, the household supports the individual's intention to migrate internationally.³

Migration Intentions

There is a burgeoning literature examining migration intentions and their determinants. For example, Esipova et al. (2011) use the GWP to present a detailed descriptive analysis of global migration intentions. Dustmann and Okatenko (2014) examine the effects of wealth constraints and local amenities in determining migration intentions. They find that the relationship depends on the level of migration cost relative to the individual's wealth and available credit. Docquier et al. (2014) study the determinants of migration intentions at the country level, as well as the probability that intentions are realized. Docquier et al. (2015) investigate the number of potential migrants (given by those who state a migration intention) who might respond to a complete liberalization of migration policy barriers. Cai et al. (2014) examine subjective well-being as an explanation for international migration intentions. They find that individuals with higher

³ Ideally, we would prefer longitudinal data collected from migrants before they migrate and after they have migrated, but such data, at the individual level, are rare.

subjective well-being have lower international migration intentions. Lovo (2014) also explores the relationship between migration and subjective well-being. She finds that migration intentions are better explained by average levels of life satisfaction in the destination country than economic statistics such as GDP per capita and unemployment rates. Ivlevs (2014) and (2015) study whether happiness affects migration intentions. He finds a nonlinear relationship with life satisfaction, where the most and the least life-satisfied people are the most likely to express intentions to migrate. Manchin and Orazbayev (2015) study the effects of social networks on individual migration intentions. They find that social networks abroad are important determinants of migration intentions; more important than employment status or household income. They also find that having stronger social networks at home reduces the likelihood of migration intentions. Bertoli and Ruysen (2016) examine the effect of migrant networks on migration intentions and destination choices. Chort (2014) examines the discrepancies between individual migration intentions in Mexico and subsequent migration behavior. She finds that women's probability to carry out a migration intention is lower than men's, suggesting unique costs and constraints associated with female migration. Ruysen and Salomone (2015) investigates whether female discrimination acts as a driver of female migration intentions and subsequent migration decisions. They find that perceived gender discrimination increases migration intentions. However, whether those migration intentions translate into migration decisions is determined by more traditional push factors such as household income and network effects.

Despite this rapidly growing literature, little is known about the direct relationship between food insecurity and migration intentions. Although some studies explore the role of poverty or wealth constraints such as Dustmann and Okatenko (2014), the direct connection with the access

to food, whether poor or non-poor, has yet to be examined. This paper fills this crucial gap in the literature by exploring these relationships from a gendered perspective.

Migration Decisions

Of course, not everyone who intends to migrate will migrate. The New Economics of Labor Migration (NELM) literature has argued that potential migrants do not make the migration decision in isolation, but rather collectively by the household for the well-being of the family (Hagen-Zanker 2008; Harbison 1981; Stark and Levhari 1982; Stark and Bloom 1985; and Taylor and Martin 2002). Thus, it is assumed that the household and migrant maximize a joint-utility function. Hoddinott (1994) argues that this informal agreement (or, migration contract) specifies how the costs and benefits of migration are shared between the migrant and household, which can represent a longer-term agreement between the migrant and his or her family members (Lucas and Stark 1985; Stark and Bloom 1985; and Stark and Lucas 1988).

While migration intentions are a necessary first step of the migration decision (Czaika and Vothknecht, 2014; Paul, 2011),⁴ these intentions result in migration only if household members agree and provide social and financial support to the intending migrant. Factors such as gender, marital status, household composition, household wealth and income, as well as networks of family and friends abroad, influence household migration decisions (Gubhaju and de Jong, 2008; Chort 2014, Czaika and Vothknecht, 2014; Nikolova and Graham, 2015). Although Stark and Bloom (1985) and Taylor (2001) highlight the roles of market failures and the need to smooth consumption in difficult times through migration decisions, there is a paucity of studies that

⁴ For example, Czaika and Vothknecht (2014) using longitudinal data to examine the relationship between the migration intentions in Indonesia and subsequent migration, find that migrants self-select along higher migration intentions. Chort (2014), Creighton (2013), Docquier et al. (2014), Dustmann and Okatenko (2014), and Manchin et al. (2014) provide empirical evidence on the positive correlation between migration intentions in the GWP data and formal international migration statistics. A common theme discussed among this literature is that migration intentions are an important compliment to formal migration statistics, since they may be able to better capture illegal migration rates.

directly examine the role of food insecurity. Moreover, there is little evidence on the effect of gender in the household decision-making process regarding migration.

Food Insecurity

While migration rates have risen in recent decades, almost 800 million people worldwide were undernourished in 2015, including 780 million in developing countries (FAO, IFAD, and WFP, 2015). The consequences of food insecurity are far reaching and complex; they go beyond the immediate impacts on the household members' health and well-being. And while there has been increased attention at the international policy level on reducing food insecurity around the world and meeting the SDGs, there has been virtually no research examining food insecurity as a push-factor of migration. We adopt the FAO definition of food security, namely the access to sufficient, safe, and nutritious food for an active and healthy life (FAO, 2009). Where food insecurity exists when this condition is not met.

While food insecurity is most common in poor households, non-poor households can also experience food insecurity (e.g., due to climatic events such as drought or flooding, job loss, food-price shocks, political instability and unrest, etc.). Thus, measuring the impact of poverty on migration intentions would miss the relationship between those that are non-poor but also food insecure, such as those working in the urban informal sector (Floro and Bali-Swain, 2012). Hence the need for a more direct analysis of the relationship between food insecurity and migration behavior.

There seems, paradoxically, to be an institutional disconnect between the migration and food security development agendas (Crush 2013). For example, Crush (2013) argues that while both international migration and global food security have their own international agencies (the International Organization for Migration and the FAO), their own international gatherings (the

Global Forum on International Migration and the World Forum on Food Security), and their own voluminous literatures, both tend to disregard each other, and little or no attempt has been made towards a more coordinated effort to address both issues. Yet, the connections between migration and food insecurity seem obvious, and one cannot be properly understood and addressed independently of the other (Crush, 2013). For example, migration provides poor individuals and households, through the promise of remittances, increased capital and social protection that can support them in times of need (Stark, 1978). Thus, efforts by households to effectively address the issue of food insecurity at home may involve the migration of a household member in search of better earning opportunities in a richer country. Strategies that effectively address the problem of food security are likely to affect international migration flows as well. This paper represents a first step in addressing this lacuna in the literature.

Gendered Migration Decisions

There is a growing awareness that gender is a critical factor in studying international migration flows. However, with few exceptions, there has been little effort to model explicitly the differences between men and women with respect to the determinants of international migration (Richter and Taylor, 2007, Gubahju and De Jong, 2008; Chort, 2014; Donato and Gabbaccia, 2015; Gammage and Stevanovic, 2016). A gendered analysis is essential for understanding international migration patterns and flows and their implications for economic development (Petrozziello, 2013). In 2015, the share of female migrants comprised slightly less than half (48 percent) of all international migrants. Female migrants outnumbered male migrants in the developed world (i.e., Europe and North America), while migrants in the developing world (i.e., Africa and Asia) were predominantly men (United Nations, 2016). Gender roles also play a large part in both migration intentions and decisions to migrate. For example, household-care responsibilities and prevailing

social norms may restrict women and act as a constraint on migration intentions (Ruysen and Salomone, 2015). On the other hand, the increased demand for caregivers in countries with increasing female labor force participation and aging populations has provided employment opportunities and acts as a ‘pull factor’ for women to consider migration (Gammage and Stevanovic 2016).

Gender and Food Insecurity

Gender has also been found to play a large role in determining food security in low- and middle-income countries. For example, using the FIES data, Broussard (2016) finds that globally, women have a higher probability of being food insecure. She argues that gender differences in household income, educational attainment, and social networks explain most of the gender gap in food insecurity. At the same time, many studies show the crucial role of women in securing food for their families, whether by growing food or working longer hours to earn income, in addition to performing domestic and care work (Sraboni et al., 2014; Doss et al., 2014). In fact, their socially ascribed role as primary caregivers often extends to the use of coping strategies to ensure their households’ access to food, whether through borrowing (Floro and Messier 2012), sale of assets (Doss, et al 2015), or migration (Donato and Gabbaccia 2015). Increased female bargaining power and educational attainment can also lead to better food security by reallocating household income towards food expenditures. Smith and Haddad (2000) for example find that improving the education level of women contributed to 43 percent of the reduction in child malnutrition that took place from 1970 to 1995 in the developing world. Sraboni, Malapit, Quisumbing, and Ahmed (2014) show that households that have an empowered female spouse have higher calorie availability and dietary diversity. Thus, if women are more likely to experience food insecurity, then gender differences in food insecurity may also have important migration implications.

Theoretical Framework

In this section, we theoretically examine two specific phases of the migration decision-making process in order to highlight the roles of food insecurity and gender.⁵ First, we develop a theoretical model to identify the possible factors that influence an individual's intention to migrate. We next examine the migration decision made collectively by the potential migrant's household. This is based on the premise that international migration decisions are typically made not by isolated actors, but rather by larger units; for example, households in which people act collectively to maximize their well-being and minimize risks (Stark and Bloom, 1985; Massey, 1998). Thus, although an individual may have intentions to migrate, his or her attitude may be supported or contested by other household members. If the former, then migration intentions can lead to the potential migrant planning and preparing for migration. If the latter, then the household as a whole may withhold financial support and use of social networks, or decline to serve as a safety net for the migrant in the destination country. In this case, migration intentions are either shelved or withdrawn.

The migration decision was first modeled in an income maximizing human-capital framework by Roy (1951) but has been extended by many others since (see e.g., Borjas, 1987; Harris and Todaro, 1970; Sjaastad, 1962).⁶ The Roy (1951) model of individual migration is the standard framework in the economics literature, and emphasizes the importance of skills, wages, the probability of employment, and the risks associated with migration (Richter and Taylor, 2007). With an emphasis on human capital, the model focuses on the cost-benefit analysis associated with

⁵ Recent migration literature has explored the decision-making process with regards to migration intentions as well as subsequent migration. For example, Chort (2014) and de Jong et al (2013) explore the factors that can mediate or interfere with migration intentions, affecting subsequent migration behavior.

⁶ More recently by Beine, Docquier, and Özden (2011); Grogger and Hanson (2011); and McKenzie and Rapoport (2007). For an excellent review see Munshi (2016).

an individual's migration decision, where he or she chooses either to stay in their country of origin or migrate to a different country; whichever is most profitable. Sjaastad's (1962) study of migration patterns in the U.S., for example, uses the human-capital framework. It treats migration as an investment decision in the productivity of human resources, which incurs both monetary (e.g., transportation) and non-monetary (e.g., foregone opportunity) costs and returns. Byerlee's (1974) theoretical framework goes beyond the conventional cost-benefit analysis of the human-capital approach by including elements of the social environment like "psychic costs" that influence migration decisions.⁷ The Harris and Todaro (1970) model highlights the fact that migration proceeds in response to differences in expected earnings between the origin area (rural in their case) and the destination (urban) area. More specifically, the decision to migrate in their model is related to the rural-urban income differential and the probability of getting an urban job.

These early models assume that individuals are rational actors who make cost-benefit calculations and are in full control of his or her decision to migrate. More recent research however argues that the appropriate unit of analysis for migration decisions are households, rather than the individual (Stark and Bloom 1985; Massey, 1998). This is particularly salient in the context of developing countries whereby an individual is not only motivated to migrate for his or her own goals but also for the survival of the household.

Individual Migration-Intention Model

In this paper, we first examine the impact of food insecurity and gender on the individual's intention or attitude towards migration. We develop a theoretical framework that draws from previous work of Harris and Todaro (1970), Byerlee (1974), and Dustmann and Okatenko (2014). This model of migration intentions differs from existing migration models in two ways: First, it

⁷ Byerlee (1974) discusses the role of risk of not finding work and breaking up old social ties as part of the "psychic costs" of migration.

focuses on the role of food insecurity in influencing a person's intention or attitude (and not decision) towards migration. Second, it explores the impact of gender via the psychic and potential financial costs of migration, as well as the likelihood of employment in the destination country.

Assume that individuals compare their utility u_k of staying in the current location, and of migrating to the potential destination. For a given time horizon, the simple utility function u_k for an individual of gender i born in country k and staying in country k represents the discounted present value of their expected utility streams over the time period. This is given by:

$$u_{kki} = f_{kki} + x_{kki} + \varepsilon_{kki}, \quad (1-1)$$

where f_k denotes the individual's food security status in origin country, x_k denotes other individual-, household-, and country-level attributes that influence his or her attitude towards migration, and ε_k denotes random individual heterogeneity. We hypothesize that greater food insecurity in country k will increase the individual's intention to migrate, as migration widens one's economic opportunities and is often considered a coping mechanism to those in low- and middle-income countries. In other words, $\left(\frac{\partial u_{kki}}{\partial f_{kki}} < 0\right)$.

The expected utility of the same individual of gender i , if he or she migrates to country j is given by:

$$E(u_{kji}) = E[f_{kji} + x_{kji} - C_{kji}(\cdot) + \varepsilon_{kji}], \quad (1-2)$$

where C_{kji} denotes the sum of the anticipated monetary (m) and psychic costs (r) of migration. It captures the anticipated financial costs associated with the migration of an individual from country k to country j , such as transportation costs, passport and visa procurement costs, as well as anticipated expenses in settling in the destination country. C_k also includes psychic costs associated with potential backlash if migration defies certain social expectations and cultural norms, as well as language barriers, and adjustment in new settings, etc. The latter are gender-specific in the sense

that men and women can have different gender-based considerations brought about by prevailing gender norms. For example, women ($i=f$) may have care responsibilities, e.g., childcare and/or sick or elderly care that make them more reluctant to consider migration. Young men (sons) may be expected to manage the family farm or take up the family business and therefore may experience pressure not to migrate, compared to young women (daughters). Women can also suffer from social backlash if they violate social prescriptions or gender norms such as taking employment outside the home or village, which often do not apply to men ($i=m$). On the other hand, women may be determined to escape from domestic violence and restrictive social norms and therefore have positive attitudes toward migration, compared to men.

Migration costs C_{kji} are therefore a function of factors such as physical distance (d_{kj}), the social and cultural characteristics of the destination and origin country (z_j), access to information about the destination country (N_j), as well as gender-related psychic costs in the origin country (p_{kk}). Thus, total migration cost is given by:

$$C_{kji} = m_{ki} + r_{ki} = c_i(d_{kj}, N_j, p_{kk}, z_j). \quad (1-3)$$

Distance is expected to have a positive effect on the financial costs of migration (i.e., $\frac{\partial C_{kji}}{\partial d_{kj}} > 0$), and thus adversely affect the decision to migrate. Access to information technology and social networks lower the information, assimilation, and adaptation costs of migration, so N_j are expected to have a negative effect on migration costs ($\frac{\partial C_{kji}}{\partial N_j} < 0$). Although both women and men experience psychic costs of migrating, this can be greater for women compared to men because of gender norms and social expectations, thus increasing migration costs for $i=f$ (i.e., $\frac{\partial C_{kjf}}{\partial p_{kkf}} > \frac{\partial C_{kjm}}{\partial p_{kkm}}$).

The individual can either have adequate resources (e.g., savings, assets, etc.) of his or her own to meet the anticipated financial costs, expect his or her family to help meet the costs, or find the financial requirements difficult to meet (e.g., access to adequate credit). Let A denote the amount of resources available to the individual to cover migration costs, so the budget constraint is given by:

$$A(a_{kji}, \Gamma_a) \geq m(\Gamma_c), \quad (1-4)$$

where Γ_a measures the individual characteristics associated with the resources available to the individual, and Γ_c measures the expected costs of migration associated with the characteristics of the intended move; such as distance, the destination's cost of living, and other country characteristics. A person will only consider migrating if he or she believes that he or she would have the requisite resources to meet the expected migration expenses.

The literature on gender and assets in low- and middle-income countries suggests the ability to meet the monetary costs of migration can differ by gender (Deere and Doss, 2006; Meitzen-Dick et al., 2014). More specifically, women are more likely to have fewer assets than men (i.e., $a_{kf} < a_{km}$). If that is the case, then women are less likely to meet the necessary expenses for migrating $m(\Gamma_c)$, compared to men. The expected utility of migrating to destination country j is also a function of the individual's ability to meet his or her food requirements, or expected food security in country j . This would depend on the individual's probability of employment in the destination country $p(emp)_j$ and the expected stream of wage earnings over the anticipated period of migration at discounted present value y_j . This in turn depends on the individual's gender i , and other individual characteristics x_j , (e.g., education and experience). In other words,

$$E[f_{kji}] = f_i(y_{kj}, p(emp)_{kj}, u_{kj}, x_{kj}). \quad (1-5)$$

As emphasized in human-capital models of migration, education is likely to be an important determinant of an individual's probability of employment. But, gender is also likely to influence the expected wage earnings y_{kj} and the probability of getting a job $p(emp)_j$ in the destination country (Gammage and Stevanovic, 2016). For example, job availability for migrants is both gender- and sector-specific. Some sectors may be female-labor intensive (e.g., care services, health sector, etc.), while others are male-labor intensive (e.g., construction). This implies that $p(emp)_{kji}$ may be higher or lower depending on the sector's labor market in the destination country. Thus, *ex ante* we are unable to predict if $E[f_{kjj}] < E[f_{kjm}]$, or vice versa. For example, if the demand for caregivers in country j is perceived to be high, then women are likely to expect a higher probability of employment, which increases the likelihood they obtain greater food security through migration and thus lead to a more favorable attitude towards migration.

Following equation (1-4), the individual intends to migrate only if $(E[u_{kji}] > u_{kki})$; subject to the constraint that $a_{kji} \geq m(\Gamma_c)$, where $m(\Gamma_c)$ may vary across individuals due to the observed and unobserved characteristics unique to his or her migration (Dustmann and Okatenko, 2014). Individuals who have intentions to migrate therefore satisfy two conditions: They believe the expected net benefits will be higher in the destination country than in their current residence; and they believe they will be able to cover the monetary costs of migration.

Thus, the probability of having migration intentions is given by:

$$Pr(\text{Intention}) = Pr\left(E[u_{kji}] > u_{kki}, a_{kji} \geq m(\Gamma_c)\right). \quad (1-6)$$

Substituting equations (1-1) and (1-2) into (1-6), we obtain:

$$Pr(\text{Intention}) = Pr\left(\frac{E[f_{kji}] + x_{kji} - C_{kji}(\cdot) + \varepsilon_{kji}}{\{f_{kki} + x_{kki} + \varepsilon_{kki}\}}, a_{kji} \geq m(\Gamma_c)\right). \quad (1-7)$$

We next substitute equation (1-3) into (1-7) to obtain:

$$Pr(\text{Intention}) = Pr \left(\begin{array}{l} E[f_{kji} + x_{kji} - \{c_i(d_{kj}, N_j, p_{kk}, z_j)\} + \varepsilon_{kji}] > \\ \{f_{kki} + x_{kki} + \varepsilon_{kki}\}, a_{kji} \geq m(\Gamma_c) \end{array} \right). \quad (1-8)$$

Note that even if migration is the optimal choice $E[u_{kji}] > u_{kki}$ (or $E[u_{kji}] - u_{kki} > 0$), individuals may not intend to migrate if $a_{kji} < m(\Gamma_c)$.

The gender dimension of the migration intention implies that its effect is *ex ante* ambiguous; that is, women may have a greater or lower propensity to have a favorable attitude towards migration than men. On the one hand, higher psychic costs (p) and fewer resources (a) can restrain women from considering migration. On the other hand, a perceived higher probability of employment among women in the destination country, compared to men, and greater psychic benefit in terms of avoidance of restrictive norms can lead up towards intention to migrate.

Household Migration-Decision Model

The early individual-choice migration theories have been challenged by several social scientists including economists. In particular, the NELM literature argues that such models are too individualistic and argue that in developing countries, the decision to migrate is typically made by household members together, and for the well-being of the entire family (see e.g., Stark and Bloom, 1985; Massey et al, 1998; Hoddinott, 1994; Taylor, 2001; Kok et al, 2003). Household members can either contest the intention of an intended migrant or support it.

We argue that the decision to migrate internationally involves the collective determinations of the household. Although an individual may hold a favorable attitude or intention to migrate, his or her view is vetted among other household members. Households may provide moral, social, and/or financial support if they view the migration will enhance the well-being of the whole household. In this case, the member with migration intentions will make the decision and prepare to migrate. On the other hand, household members may contest the view held by the individual and withhold support, which then compels the individual to stay.

We develop a household migration decision framework based on Hoddinott's (1994) model. The model differs in three ways: First, we focus on households where there is at least one member who has a stated migration intention. Second, we explore the role of food insecurity within the broader decision-making framework. Third, the model takes into consideration gender and power dynamics within the household, which shapes or even directly determines the outcome of household decisions. The model highlights gender roles within the household and the fact that certain members have lower bargaining power than others (Law 1998; Radcliffe 1991).

We assume that there are two agents in this household semi-cooperative model; the prospective migrant and other members of the households (e.g., head, parent, spouse, etc.). Both the prospective migrant and other household members derive utility solely from their own consumption of goods and leisure. However, the migration decision is a collective one, whereby all members maximize a joint-household utility function defined over two states, s . When the member with migration intentions migrates, $s=1$; and when he or she stays, $s=0$. Implicit in the migration state ($s=1$) is a "migration agreement" that yields benefit to all household members and that specifies how the costs and benefits of migration are to be shared between the migrant and the rest of the household.

We assume that the individual with migration intentions prefers maximizing a joint-utility function with the household, rather than "going on his or her own." This is because there are mutual benefits for the two agents. The prospective migrant gains financial support from the household in meeting migration costs (e.g., visa, pocket money, travel, and relocation expenses) when settling in the new country and broader social networks for obtaining information. The household also provides a form of unemployment and old-age insurance by allowing the migrant to return should he or she fail to find work, is laid off, or wishes to retire. Thus, the migration costs are shared

between household members and there exists household migration co-insurance. In turn, the household members gain access to future income that is uncorrelated with their livelihood and can serve as insurance in the presence of shocks. These mutual benefits are one means by which this arrangement is made incentive compatible.

Disagreement can be costly especially for the member with migration intentions and therefore can lead to the non-migration state ($s=0$). Consider the case where the individual has intentions to migrate but other household members wish him or her to remain. If he or she acts on their own intention solely, they may be denied financial support to meet migration costs. There could also be social disapprobation and distancing. The implicit contract between the household members is therefore based on mutual interdependence: Mutual benefits, credible threats, and monitoring all serve to make the migration contract incentive compatible (Hoddinott 1994, p. 461). It should be noted however that the household migration decision takes place in the context of uncertainty, which is why coinsurance and diversification of income sources are relevant.

We assume that the household member of gender (i) with migration intentions and all other household members' (h) utility functions are strictly quasi-concave. Thus, the household utility function is given by:

$$U_{ki}^h = F_{ki}^h + X_k^h + \mu_{ki}^h, \quad (2-1)$$

where F_{ki} denotes the household's food security status, X_{ki} denotes other individual-, household-, and country-level attributes that influence their attitude towards migration, and μ_k denotes random household heterogeneity. As in the case of the individual household member intending to migrate, the household h in country k compares its utility U^h between two states: the household member who intends to migrate either migrates to country j (U_{kji}^h) or stays in country k (U_{kki}^h). Households may decide to send one of its members to work abroad if access to food is subject to risk brought

about by natural disasters, environmental degradation, low and/or variable earnings, etc. Other factors can also affect the household's attitude towards migration including social status, political instability, better quality of life, and employment opportunities for the intending migrant.

Other household members support the intending migrant move only when the expected net return to migration for h over the period of expected migration is positive and greater than the utility of not sending the migrant ($E(U_{kji}^h) > U_{kki}^h$). Let $E(U_{kji}^h)$ be defined as:

$$E(U_{kji}^h) = E[F_{kji}^h + X_{kji}^h - C_{kji}^h(\cdot) + \mu_{kji}^h], \quad (2-2)$$

where C_{kji}^h denotes the sum of the anticipated household monetary and psychic costs of migration, and is given by:

$$C_{kji}^h = M_{ki}^h + P_{ki}^h = C_i^h(D_{kj}, N_j, P_{kk}, Z_j). \quad (2-3)$$

We assume for the sake of simplicity that the household shares information about the monetary part of migration costs so that $M_{ki}^h = m_{ki}$. But the psychic costs P_{ki}^h faced by the household is different from that of the potential migrant (p_{ki}), and they are influenced by gender roles and social expectations. For example, daughters or wives ($i=f$) may be expected to stay at home, thus making $P_{kf}^h > p_{kf}$. On the other hand, sons or husbands ($i=m$) may be expected to help diversify livelihood sources and increase household income through remittances, in which case $P_{km}^h < p_{km}$. Hence, household costs C_{kji}^h can be larger or smaller than that of the intending migrant's individual costs. Household costs are also likely to be greater for $i=f$ (i.e.,

$$\frac{\partial C_{kjf}^h}{\partial P_{kkf}^h} > \frac{\partial C_{kjm}^h}{\partial P_{kkm}^h}.$$

Household members can pool their household resources, which include savings as well as loans from various lenders, to meet the monetary costs of migration. Let A^h denote the amount of resources available to the household to cover migration costs, which is larger than

the resources available to the individual A . The household budget constraint is given by:

$$A^h(\alpha_{kji}^h, \Gamma_a^h) \geq M(\Gamma_c^h), \quad (2-4)$$

where Γ_a^h measures household characteristics associated with the resources available to the household as a whole, and Γ_c^h measures the expected monetary costs of migration associated with the characteristics of the intended move; such as distance, the destination's cost of living, and other country characteristics. Equation (2-4) shows the threshold above which the household can cover migration costs. Households with resources α_{kji}^h below the threshold $M(\Gamma_c^h)$, are not able to cover the cost of migration and therefore not able to support the intended migration move.

The intending migrant and other household members agree to maximize a joint utility function that takes the following form:

$$N = [E(u_{kji}) - u_{kki}]^{\omega_i} \times [E(U_{kji}^h) - U_{kki}^h]^{\omega_h}, \quad (2-5)$$

where ω_i is the weight attached to the intending migrant's individual utility; ω_h is the weight attached to household's utility; and $\omega_i + \omega_h = 1$. The respective weights depend on the position of the individual in the household and gender norms; ω_i also represents the relative bargaining power of the individual in household decision making. The literature on household bargaining indicate that women are less likely to have bargaining power within the household. If that is the case, then intending female migrants are less likely to have more weight attached to their utility than their male counterparts, or $\omega_m > \omega_f$.

The expected utility of household $E(U_{kji}^h)$ is a function of the present discount value of the stream of expected remittances $E(R_{kji}^h)$ that would be sent to the household. The household's ability to meet their food requirements, or the expected food security status if the intending

migrant leaves for country j , depends on the expected household income that includes the present discounted value of the stream of expected household income (without the migrant member), Y_{kji}^h and $E(R_{kji}^h)$. The latter would depend on the intending migrant's probability of employment in the destination country $p(emp)_j$ and the expected stream of wage earnings over the anticipated period of migration. The probability of employment $p(emp)$ in turn depends on the individual's gender i , and other individual characteristics x_k (e.g., education and experience). In other words,

$$E(R_{kji}^h) = f_i(p(emp)_{kj}, u_{kj}, x_{kj}). \quad (2-6)$$

Note that even if migration is the optimal choice for the household, i.e. $N > 0$ (or $E[U_{kji}^h] > U_{kki}^h$), the household will not support migration if $A_{kji}^h < M(\Gamma_c^h)$, or if $(E[U_{kji}^h] < U_{kki}^h)$. Thus, the probability of a migration decision is given by:

$$Pr(\text{Decision}) = Pr(N > 0, A_{kji}^h \geq M(\Gamma_c^h)). \quad (2-7)$$

Inserting equation (2-5) into (2-7) and dropping the weights ω , we obtain:

$$Pr(\text{Decision}) = Pr(\{E(u_{kji}) > u_{kki}\}, E[U_{kji}^h] > U_{kki}^h, A_{kji}^h \geq M(\Gamma_c^h)) \quad (2-8)$$

Substituting equations (2-1) and (2-2) into (2-8), we obtain:

$$Pr(\text{Decision}) = Pr\left(\begin{array}{l} E[F_{kji}^h + X_{kji}^h - C_{kji}^h(\cdot) + \mu_{kji}^h] > \\ \{F_{kki}^h + X_{kki}^h + \mu_{kki}^h\}, A_{kji}^h \geq M(\Gamma_c^h) \end{array}\right) \quad (2-9)$$

We next substitute equation (2-3) into (2-9) to obtain:

$$Pr(\text{Decision}) = Pr\left(\begin{array}{l} E[F_{kji}^h + X_{kji}^h - \{C_i^h(D_{kj}, N_j, P_{kk}, Z_j)\} + \mu_{kji}^h] > \\ \{F_{kki}^h + X_{kki}^h + \mu_{kki}^h\}, A_{kji}^h \geq M(\Gamma_c^h) \end{array}\right). \quad (2-10)$$

A particular feature of this household decision model is that the individual migration decision models such as Harris and Todaro (1971) and Dustmann and Okatenko (2014) can be treated as special cases. Recall that ω_i and ω_h indicate how the migration decision by the intending

member and the rest of the household members are weighted. If $\omega_i = 0$ and $\omega_h = 1$, the maximand is the household utility function, which is similar to the models of Massey (1998) and Kok et al (2003). On the other hand, if $\omega_i = 1$ and $\omega_h = 0$, the maximand is the intending migrant's utility function.

Gender influences the household migration decision in three ways: First gender influences the psychic costs P_{ki}^h , endured by the other household members. For example, if the intending member is female, her migration may violate gender norms or go against social expectations, thus raising P_{kf}^h and therefore C_{kji}^h . If $C_{kji}^h > E(R_{kji}^h)$, then the household will withdraw its support for migration. Second, gender determines the bargaining position of the prospective migrant within the household and therefore affects ω_i . If female members are likely to have lower bargaining position in household decisions, then $\omega_i \rightarrow 0$ and $\omega_h \rightarrow 1$. Finally, gender can affect the probability of employment, and therefore the expected stream of remittances.

The two-stage model presented above results in a set of 6 hypotheses that we empirically test; 3 with respect to the individual's migration intentions, and 3 with respect to the household's migration decision. With respect to migration intentions in the first stage: H1: since food insecurity decreases an individual's utility in their country of origin u_{kki} , we expect food insecurity to be associated with an increase in migration intentions; H2: by holding constant an individual's characteristics and thus, their cost of migration C_{kji} , we expect migration intentions to increase with the severity of food insecurity; and H3: given socially-ascribed gender roles (particularly with respect to care and household maintenance responsibilities), unequal access to resources between men and women, and rising demand for caregiving in some countries, we expect the relationship between food insecurity and migration intentions to vary significantly by gender.

Next, with respect to migration decisions in the second stage: H4: we expect the effect of food insecurity on household migration decisions to be ambiguous. On one hand, it may be associated with a decrease in migration decisions, since the inability to purchase enough food for an active and healthy life would also imply the inability to purchase other migration-related resources (visa applications, airline tickets, etc.). On the other hand, food insecurity is likely to increase the need to use migration as a coping strategy to diversify livelihood strategies and smooth household consumption. H5: we expect migration decisions to decrease with the severity of food insecurity since severe food insecure households are more likely to have a higher discount rate (i.e., use its resources immediately towards meeting their food needs instead of investing in longer-term strategies of securing food through international migration); and H6: given socially-ascribed gender roles, unequal access to resources between men and women, and rising demand for caregiving in some countries, we expect the relationship between food insecurity and household migration decisions to vary significantly by gender.

Data

The analyses in this paper use data from the 2014 and 2015 waves of the GWP, including FAO's FIES data. Since 2005, the GWP has conducted an annual survey of individuals age 15 years and older in over 150 countries. The GWP collects information on individual's labor force participation status, educational attainment, opinions, experiences, future aspirations, demographic characteristics, household income, and country-identifiers. In most countries, the GWP interviews 1,000 adults, and is nationally representative.⁸ Telephone interviews are

⁸ The GWP typically interviews 1,000 individuals per country, but increases the sample size per the population size of the country for some of the largest countries. For example, 3,000 and 5,000 individuals were interviewed in India and China, respectively, in 2014-15.

conducted for medium- and high-income countries with at least 80% telephone coverage. Face-to-face interviews are administered in most developing countries.

In 2014-15, the GWP interviewed 337,580 individuals living in 153 distinct countries.⁹ Since we focus on migration behavior among food insecure people in developing and transition countries, the sample consists of potential movers from countries where food insecurity is likely to be of greater concern. Thus, the sample is restricted to low- and middle-income economies based on the World Bank, Atlas method ranking of economic development. Low-income economies are defined as those with a gross national income (GNI) per capita, of \$1,045 or less, middle-income economies are those with a GNI per capita of more than \$1,045 but less than \$12,736 (World Bank, 2016). Further, we decompose the sample into five global regions, to isolate any regional heterogeneity in migration behavior and food insecurity. The regions are East Asia and the Pacific; Europe¹⁰ and Central Asia; Latin America and the Caribbean; Middle East and North Africa; and Sub-Saharan Africa. Lastly, we restrict the sample to ages 18 to 64, where the likelihood of migration is greatest. We dropped observations for individuals without valid measures of food insecurity or who failed to provide valid information on one or more of the questions used to construct the control variables.¹¹ The final sample is 124,198 individuals in 90 low- and middle-income countries.¹²

Migration Intentions and Decisions

The GWP is a unique dataset and offers several questions related to a potential migrant's situation and attitudes before they migrate. First, we are interested in an individual's migration

⁹ GWP also includes territories such as Northern Cyprus and Palestine, but for the sake of this paper we refer to them as countries.

¹⁰ While these countries are considered "Europe" by the WDI, they could also be defined as "transition" economies. However, to maintain consistency with the WDI, we maintain their Europe designation.

¹¹ An analysis of the missing observations suggests that there is no systematic difference with respect to the migration behavior (intentions and decisions) of those failing to answer questions.

¹² Appendix E presents the list of countries, regions, and development rankings.

intentions and use the survey question: *Migration Intentions*—Ideally, if you had the opportunity, would you like to move permanently to another country, or would you prefer to continue living in this country? This is a binary variable that equals one if the individual wishes to migrate internationally; zero otherwise.

Next, although the literature shows that migration intentions are relatively good predictors of subsequent migration behavior (Creighton, 2013; Nikolova and Graham, 2015; Simmons, 1985; van Dalen and Henkens, 2008; 2013), we do not assume everyone who expresses an intention to migrate will ultimately do so. We further examine the factors influencing an individual's migration decision after expressing a migration intention. This takes into account the household's influence on the intending migrant's behavior. In other words, the subsequent migration decision reflects the outcome of the collective household decision to support (or not) the migration intention of its member. We use whether an individual has made preparations to migrate (purchased an airline ticket, or applied for a visa), as a proxy for the migration decision. *Migration Decisions* is a binary variable that equals one if the individual has done any preparation to migrate internationally; zero otherwise. Only respondents with migration intentions were asked about their migration preparations.

Finally, as a sensitivity check on *Migration Intentions*, we examine the relationship between food insecurity and gender on an alternate proxy variable, *Migration Plans*. This dependent variable comes from the survey question, *Migration Plans*—Are you planning to move permanently to another country in the next 12 months, or not? This is a binary variable that equals one if the individual has concrete international migration plans to move in the next 12 months; zero otherwise. Similar to *Migration Decisions*, only respondents with migration intentions were asked about their migration plans. It can be argued that *Migration Plans* is perhaps defined less

precisely than *Migration Intentions*, since it serves as an intermediate step between the intention and decision of migration. However, it captures a concrete predisposition to migrate, and the specified time frame (12 months) provides respondents an additional focus (Ivlevs, 2015; Nikolova and Graham, 2015; Ruysen & Salomone, 2015).

Focal Explanatory Variables

The two focal explanatory variables of interest are gender and food insecurity. The construction of the food insecurity indicator used in the analysis requires some explanation. The Food Insecurity Experience Scale Survey Module (FIES-SM) was included as a client module in the GWP for the first time in 2014 as a part of FAO's Voices of the Hungry project. The FIES-SM was designed to measure the prevalence and severity of food insecurity experienced by individuals. Information about the adequacy of an individual's access to food is assessed using a series of eight questions about their behaviors and experiences while having difficulty meeting their basic food needs over the past 12 months (see Appendix A).

Research has shown that hunger in the household is initially characterized by worry about having enough food, followed by dietary changes to make current food last longer, and finally, manifested by decreased food consumption, first in adults followed by any children (Radimer, Olson, and Campbell, 1990; Radimer, Olson, Greene, Campbell, and Habicht, 1992). Further, the experience of households living with hunger is found to be consistent in developed and developing countries alike; across languages and cultures (Coates et al., 2006).¹³

Experiential food insecurity scales in the United States, Canada, Mexico, and Latin America over the last few decades have been validated in many studies (e.g., Coates, 2013; Coates, Frongillo, et al., 2006; Coates, Swindale, and Bilinsky, 2007; Coates, Wilde, Webb, Rogers, and

¹³ For a more comprehensive review of the evolution of food insecurity measurement, see e.g., Coates (2013); Jones, Ngure, Pelto, and Young (2013); and Marques, Reichenheim, de Moraes, Antunes, and Salles-Costa (2015).

Houser, 2006; Frongillo and Nanama, 2006; Nord, 2002; Perez-Escamilla, 2012). Experiential measures are also able to capture cross-cultural aspects of food insecurity and have successfully proven their validity across global regions and development rankings (Coates, 2013; Frongillo et al., 2017; Perez-Escamilla, 2012; Smith et al., 2017a).

Item Response Theory, or more specifically, the single-parameter logistic measurement model commonly known as the Rasch Model (Fischer and Molenaar, 2012; Rasch, 1960) is used to assess and combine individual responses to the FIES-SM in which the individual's severity of food insecurity is modelled as a latent trait—a characteristic not directly observable (Nord, Cafiero, and Viviani, 2016). Observable conditions assumed to be caused by the latent trait are elicited by the FIES-SM. A Rasch scale (Rasch, 1960) is estimated for each country, and each country's scale is adjusted to a global reference scale. Provided the FIES data pass a statistical test of fit to the Rasch model's (Rasch, 1960) assumptions, an individual's food security status can be determined by summing the affirmed responses (i.e., the raw score).¹⁴ Raw-score-based classifications are typical of other experiential food security scales, such as the US-HFFSM in the United States, and the ELCSA in the Latin American region. The classification methods of these scales however, do not allow cross-country comparisons since the same raw score would not necessarily correspond to the same level of severity in different countries.

To ensure the measured severity of food insecurity is comparable across countries, FAO equated the food insecurity scales for each country to a FIES Global Standard Scale (FIES-GSS). FAO's equating procedure maintains cross-country comparability by creating two food insecurity thresholds—moderate food insecurity and severe food insecurity—and adjusts these thresholds for

¹⁴ Under the Rasch measurement model the raw score is a sufficient statistic for the latent trait that is being measured—food insecurity in this case.

each country. Thus, the measured severity of food insecurity, food insecurity thresholds, and the food insecurity prevalence rates are all comparable across countries.¹⁵

For the purposes of this study, individuals are classified as *food secure* if they answered no to all eight items. Individuals are classified as having *mild food insecurity* if they affirm one or more of the FIES items, up to the raw score level that corresponds to the mild threshold. Individuals are classified as having *moderate food insecurity* if they affirm a number of items between the raw scores of the moderate and severe thresholds; and are classified as having *severe food security* if they report a raw score equal to or above the severe threshold.¹⁶ Thus, the food insecurity index variable represents the ordinal categories of food insecurity; namely, food secure (0), mild food insecurity (1), moderate food insecurity (2), and severe food insecurity (3), with each respondent deterministically assigned to one of the four classes.

Other Explanatory Variables

We consider other possible migration determinants that include individual, household, and macroeconomic characteristics. For migration intentions, we use controls for area of residence, age, marital status, education, labor force status, social networks, information technology access, and national income. Furthermore, the progression from an individual intention to a migration decision depends on additional household factors. As shown in the theoretical model, household decisions regarding migration are influenced by a number of additional factors such as household income, household composition (number of adults and children), transportation access, and

¹⁵ For a more in-depth discussion for the equating methodology used by FAO to construct the FIES-GSS, see FAO (2016).

¹⁶ The distinction between the “food secure” and “mild food insecure” classes, as presented here, may be subject to some error due to the difficulty in precisely determining the probability of being “mildly” food insecure. In some countries, most respondents have raw-score zero, so ignoring measurement error in that group may have implications for prevalence estimation at the lowest raw-score thresholds. For more details on probabilistic assignment of respondents to food security classes, see FAO (2016, section 6, pp.17-19).

national-level employment shocks. Appendix B lists the variables used in the analysis and a brief description of their construction.

We use respondent *Age* and *Age-squared* (in years), since previous migration literature has largely found that the young are more likely to migrate than the old. Additionally, since older people have a shorter time horizon, an increase in migration costs tend to decrease migration more for older than for younger individuals (Schiff and Morrison, 2007). Education level is measured categorically according to the highest level of attainment by the respondent: *Elementary education* (eight years of education or less); *Secondary education* (nine to 15 years of education), and *Post-secondary education* (four years of education beyond “high school” or a college education). Research has largely found that migrants tend to self-select according to their education level (i.e., the more educated the potential migrant is, the more likely they are to migrate; Docquier et al., 2007, 2017; Grogger and Hanson, 2011; Belot and Hatton, 2012). Education level can also proxy for labor productivity and an individual’s potential earnings in the destination country (Sjaastad 1962).¹⁷

Education, social networks, and access to information technology have been found to influence migration by providing individuals with information about potential migration opportunities and influencing migration costs (Munshi and Rosenzweig, 2009; Manchin and Orazbayev, 2015; Nikolova and Graham, 2015). Research on migrant networks has emphasized the role of social networks and diasporas in lowering migration costs and thus increasing international migration flows (e.g. McKenzie and Rapoport, 2007; McKenzie and Rapoport, 2010; Massey, 1993). Thus, we include the following dummy variables that equal one if the individual:

¹⁷ For example, highly educated women have been found to look towards migration for better opportunities, when they feel constrained by social norms and a lack of employment opportunities (Hondagneu-Sotelo, 1994; Schiff and Morrison, 2007).

is satisfied with their ability to make friends in the origin country (*Social network*); can count on relatives or friends living in another country (*Help outside country*); has access to the internet at home (*Internet*); and has access to a television at home (*Television*).

Marital status has also been found to play a large role in migration decisions, where single women are more likely to migrate than married ones (Kanaiaupuni 2000; Schiff and Morrison, 2007). Marital status is represented by a set of dummy variables for *Single or never been married*; *Married or domestic partner*; and *Separated, widowed, or divorced*. The number of children in the household can also influence migration decisions as they can dictate who in the household migrates and potentially how remittances are directed (Hoddinott, 1994; Kanaiaupuni 2000; Schiff and Morrison, 2007). Schiff and Morrison (2007) argue that the presence of additional adults in the household who can fill in for the migrant's labor and reduce the opportunity cost of migration can also increase the likelihood of household migration decisions. Thus, we control for both the *Number of adults* and the *Number of children* in the household decision model.

Volatility of household income can influence household migration decisions by incentivizing the search for more stable sources of income in destination countries (e.g., to smooth household consumption and liquidity constraints). Therefore, we include household income as a wealth proxy.¹⁸ We construct a quintile version of household income to allow for nonlinear effects between income and migration behavior (i.e., to allow for the possibility of increase or decreasing functions of migration decisions and household income).

Macro-level Characteristics and Shocks as Control Variables

¹⁸ Household income is initially reported in the individual's local currency. Respondents who have difficulty answering the question are presented a set of ranges in local currency and are asked which group they fall into (Gallup, 2015). Household income is then equated across countries by converting the local currency to international dollars using the World Bank's PPP (2011) private consumption conversion factor. This measure also relies on multiple imputation methodology to replace missing values.

Macro-level factors can also influence migration decisions in a given country. Previous research has found an inverse U-shaped relation between a country's level of economic development and migration (de Haas, 2009; Hatton and Williamson, 2002). Migration rates from poor and rich countries tend to first increase and then decrease with economic development (UNDP, 2009). To control for this relationship, we include *Log GDP per capita (2010 US\$)* from the World Bank's World Development Indicators. Additionally, we take into account any economy-wide employment shocks with the variable *Unemployment*, also from the World Development Indicators. High national unemployment has been shown to affect migration decisions, whereby potential migrants seek to migrate to areas (or countries) with lower levels of unemployment (Hunt, 2006).

Political conditions such as internal conflicts, repression, suspension of civil liberties, or lack of freedom of expression can also influence migration decisions. We use the following measures as proxy indicators of the political conditions in the respondent's country of origin: *Regime Type*, taken from the Polity IV database (an ordinal measure representing the type of government in that country: Autocracy, Anocracy, or Democracy); *Ethnic fragmentation*, also taken from the Polity IV database (an ordinal measure representing the degree of ethnic fragmentation in that country: No overt fragmentation, Slight ethnic fragmentation, Moderate ethnic fragmentation, and Serious ethnic fragmentation).¹⁹

A number of recent studies have examined the role of wars and conflicts on international migration (see e.g., Long and Rosengaertner, 2016; Vargas-Silva, 2016) and found evidence that political violence, ethnic conflicts, and wars are likely to increase both voluntary migrants and also

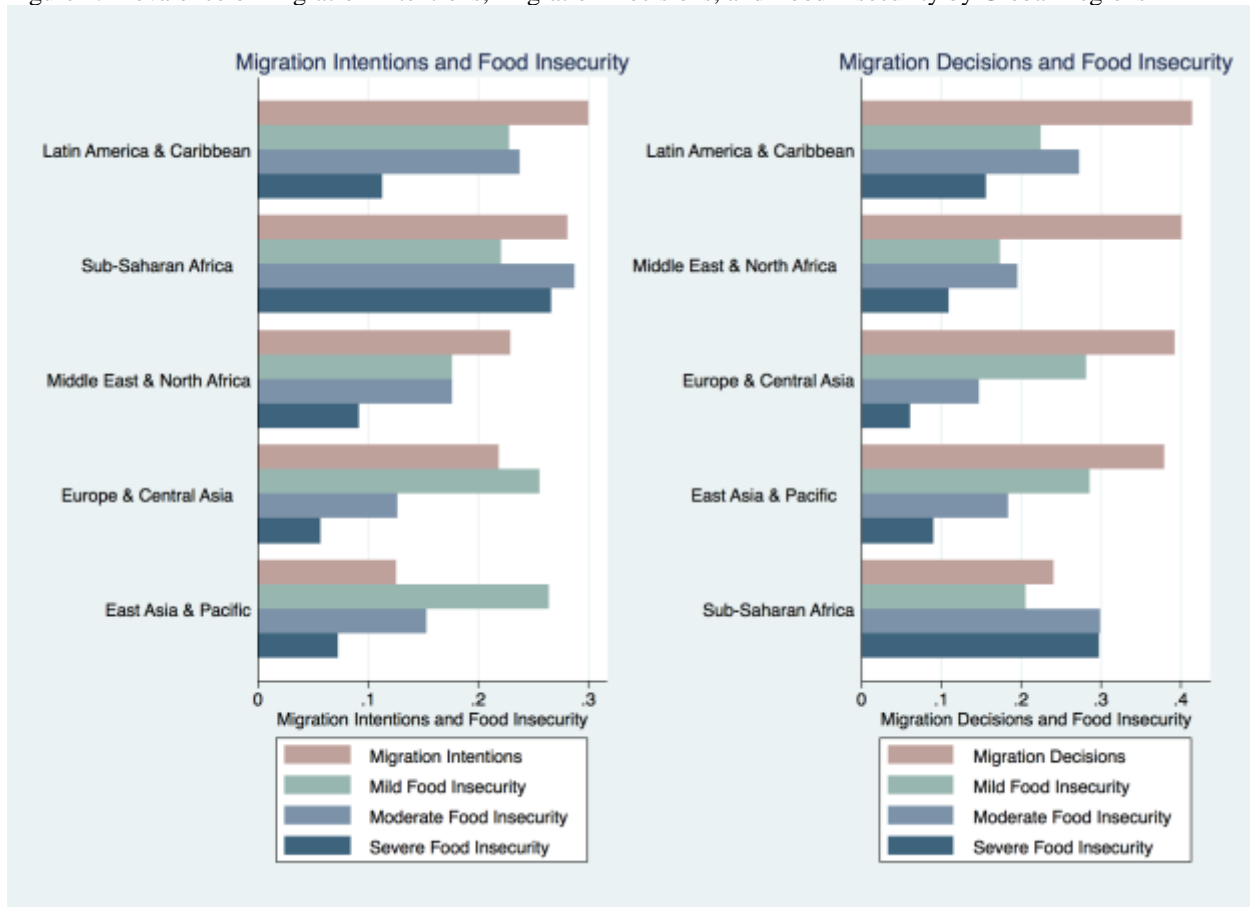
¹⁹ For example, serious ethnic fragmentation means that over twenty-five percent (and up to fifty percent) of the country's territory is effectively ruled by local authority and actively separated from the central authority (Marshall and Jaggers, 2016).

refugees (involuntary migration; Castles et al., 2013). Although political violence and conflicts can occur for a multitude of reasons (political, social, and economic), it is possible that disputes over land, water, and other resources affecting food security can lead to violence and conflicts (McGuirk and Burke, 2017). We use two measures from the Major Episodes of Political Violence (MEPV) database to control for the likely effect of ethnic and civil violence that may influence migration behavior. *Magnitude of ethnic violence* is a measure of the magnitude of episode(s) of domestic ethnic violence involving that country in that year. *Magnitude of civil violence* is a measure of the magnitude of episode(s) of domestic civil violence involving that country in that year.

Finally, we take into account the effect of frequency of environmental disasters on migration behavior by using two variables from the Centre for Research on the Epidemiology of Disasters (CRED) Emergency Events Database (EM-DAT): *Occurrences* is the total number of natural disasters occurring in that country in that year. *Percent affected* is the number of people affected by natural disasters in that country in that year; divided by the population.²⁰

²⁰ Natural disasters are composed of any of the following events: Geophysical (earthquake, volcanic activity, etc.), Meteorological (extreme temperature, storm, etc.), Hydrological (flood, landslide, etc.), Climatological (drought, wildfire, etc.), Biological (epidemic, etc.), or Extraterrestrial (meteoroid, space weather, etc.).

Figure 1. Prevalence of Migration Intentions, Migration Decisions, and Food Insecurity by Global Regions



Notes: Data source is GWP/FAO, 2014-15.

Figure 1 shows significant regional variation among low- and middle-income countries in terms of migration behavior and the prevalence of food insecurity as measured by FIES. The chart on the left shows migration intentions and food insecurity; while the chart on the right shows migration decisions and food insecurity for those with stated migration intentions. Latin America and the Caribbean has the highest prevalence of migration intentions (30.1%), followed by Sub-Saharan Africa (28.1%), and the Middle East and North Africa (22.9%). However, Sub-Saharan Africa leads in terms of experiencing both moderate (28.8%) and severe food insecurity (26.6%). Interestingly, East Asia and the Pacific has the lowest level of migration intentions (12.6%), and the highest prevalence of mild food insecurity (26.5%). Looking at the chart on the right, we see

that for those with stated migration intentions, Latin America and the Caribbean has the highest prevalence of migration decisions (41.5%), followed by the Middle East and North Africa (40.1%), and Europe and Central Asia (39.3%). However, for those with migration intentions, Sub-Saharan Africa still leads in terms of experiencing both moderate (20.6%) and severe food insecurity (30.0%).

Econometric Methods

The remaining empirical analyses use multivariate statistical methods to better understand the determinants of migration intentions and subsequent migration decisions. The relationship between food insecurity and migration behavior is likely to vary significantly by gender. Women are less likely to intend to migrate than men if they have higher psychic costs owing to household and care responsibilities and socially-ascribed gender norms. Women are less likely to decide to migrate than men if they face restrictions in mobility, and/or have fewer resources to meet the costs of migration due to gender inequality in access to resources and jobs. On the other hand, women are more likely to decide to migrate if the probability of employment in the destination country is differentially high due to increased demand for care labor, thus making their expected earnings greater than the anticipated costs and their current earnings.

Migration Intentions: Hierarchical Linear Model

The analyses adopt a hierarchical linear²¹ model specification to consider the migration intentions of individuals and to mitigate bias from the clustering of individuals within countries, and country time-invariant omitted variables. At the first level, we take into account individual- and household-level characteristics that are likely to influence the probability of having migration intentions. At the second-level, we also consider country-level characteristics that influence the

²¹ We found very similar results using hierarchical logistic models.

intention of individuals residing in a given country. To ignore these nested relationships risks overlooking the importance of cluster effects (individual and country levels), and may also render invalid certain traditional statistical analysis assumptions (Goldstein, 2011). For example, because of this clustering, the assumption that observations are independent and identically distributed is violated. Hence, hierarchical (or multilevel) linear models are the standard framework for clustered data in econometric analysis (Cameron and Trivedi, 2005; Gelman and Hill, 2007; Goldstein, 2011).

The hierarchical model assumes the probability of an individual intending to migrate is given by:

$$m_{igc} = \alpha + x_{igc}\beta + f(w_{igc}, \gamma) + z_c + v_c + \varepsilon_{igc}, \quad (1)$$

where m_{igc} is a binary measure equal to 1 if person i of gender g , located in country c intends to migrate; x_{igc} consists of observable individual characteristics; $f(w_{igc})$ is a function of the individual's ordinal food security status, with parameter γ ; z_c contains country-level information; v_c is the random effect at the second level (country); and ε_{igc} represents the unobserved individual heterogeneity. The analyses assume the errors v_i , and ε_{igc} are distributed independently of each other and as Gaussian with means of zero and variances of σ_i^2 , and σ_{igc}^2 .

Migration Decisions: Binary-Choice Model with Sample Selection

Since migration decisions are only observed when migration intentions equal unity, we adopt a binary-choice model with sample selection when examining the determinants of migration decisions. We cluster the standard errors at the country level to mitigate bias from the clustering in the GWP described above. Thus, the probability of an individual deciding to migrate is given by:

$$y_{igc}^* = x'_{igc}\beta + f(w_{igc}, \gamma) + z_c + \varepsilon_{igc}, \quad (1)$$

$$m_{igc}^* = v'_{igc}\gamma + u_{igc}, \quad (2)$$

$$m_{igc} = 1(m_{igc}^* > 0), \quad (3)$$

$$y_{igc} = \begin{cases} 1(y_{igc}^* > 0) \text{ if } m_{igc} = 1 \\ \text{"missing"} \text{ otherwise} \end{cases}, \quad (4)$$

where i , g , and c are indexes for individuals, the individual's gender, and the individual's country. The first equation is the main equation of interest, where y_{igc}^* is the latent dependent variable (*Migration Decisions*); x'_{igc} is a vector of exogenous explanatory variables; and ε_{igc} is unobserved random individual heterogeneity. The second equation is the selection equation, where m_{igc}^* is the latent dependent variable (*Migration Intentions*), v'_{igc} is a vector of exogenous explanatory variables for the individual's migration intentions, and u_{igc} is the unobserved individual heterogeneity. The third equation states that m_{igc}^* is a latent variable and only the sign is observable. Equation (4) shows that the same is true for y_{igc}^* , but only if m_{igc} is equal to one. In other words, migration decisions are only observed for those who state a migration intention; otherwise, y_{igc}^* is not observed. We assume the error terms have a bivariate Gaussian distribution with zero means, unit variances, and a correlation coefficient ρ .

This model differs from the classic sample-selection estimators introduced by Heckman (1979) and Amemiya (1984) by the fact that the dependent variable of the outcome equation is binary. When $\rho \neq 0$, standard probit estimates of equation (1) are biased. Identification of the model parameters requires imposing at least one exclusion restriction on the two sets of exogenous covariates in equations (1) and (2; Meng and Schmidt, 1985). Following the theoretical framework, the exclusion restrictions represent the information used by the household to either contest or support the individual's migration intentions. The exclusion restrictions in the migration decisions model (and not in the migration intentions model) are the following household variables: *Number*

of adults, Number of children, Household income quantiles, Transportation access, and National unemployment.

Robustness and Sensitivity Analyses

We provide a series of robustness checks for the models of both outcomes. First, for both migration intentions and migration decisions, we examine if any time-invariant unobserved factors may be influencing the results by using country fixed effects (by including a dummy variable for each country in the sample). Next, we conduct analyses to control for possible measurement error of both dependent variables. Measurement error might stem from the fact that the sample includes previously arrived immigrants (Ruysen and Salomone, 2015). Former migrants might be temporary and/or may be more likely to migrate again and could exhibit different migration behavior than native-born individuals (Ruysen and Salomone, 2015). To test the sensitivity of the results to the inclusion of previous migrants we re-estimate the models excluding them from the sample, keeping only respondents who were born in the country.

Next, we conduct several robustness checks on the sample-selection model used for migration decisions. Sample-selection estimators are notoriously sensitive to small deviations in distributional assumptions. First, we examine the correlation coefficients ρ to affirm the need for the sample-selection estimator. Next, we compare a hierarchical linear model on migration decisions, similar to the migration intentions model, ignoring the non-random sample selectivity in the data. Finally, we test the sensitivity of the chosen exclusion restrictions. In all robustness checks, we find that doing so does not change the relationship between food insecurity and migration behavior. Thus, the results are found to be robust across model specifications (see Tables 6 and 7).

Results

The regression results confirm that food insecurity represents a significant determinant of migration behavior among individuals in low- and middle-income countries. Tables 2 and 3 present results from the total sample of low- and middle-income countries (Column 1), as well as separate regressions for female and male respondents (Columns 2 and 3, respectively). The results given in Table 2 are the average marginal effects estimated by the hierarchical linear model for migration intentions. The results in Table 3 are the conditional average marginal effects for migration decisions using the binary-choice model with sample selection. The various subsamples in Tables 2 and 3 allow us to examine the heterogeneity of the relationship between food insecurity and migration behavior by gender.²²

Migration Intentions

The results in Table 2 indicate that the relationship between food insecurity and migration intentions is statistically significant, which supports the H1 hypothesis. In each column, food insecurity is associated with a significant increase in the probability of migration intentions; where the magnitude of the marginal effects suggest that the probability increases monotonically with the severity of food insecurity. This finding is consistent with the H2 hypothesis, that the likelihood of intending to migrate is determined by the severity of food insecurity. In fact, Column 1 shows that the probability of intending to migrate is highest among individuals experiencing either *severe food insecurity* or *moderate food insecurity*. For the total sample (Column 1), being severely food insecure and moderately food insecure is associated with an 11.3 percentage-point and 9.0 percentage-point higher probability of intending to migrate, respectively.

²² We tested the estimated coefficients and found evidence that the covariates varied significantly by gender, justifying the gender-separated models.

We also find evidence that the probability of having migration intentions is influenced significantly by gender. Column 1 shows that, after controlling for other individual and household characteristics, women generally have lower intentions to migrate than men. More specifically, women are 3.8 percentage points less likely to intend to migrate, compared to men. This suggests that, controlling for the level of food insecurity and other individual and household characteristics, women are likely to have higher psychic costs due to migration, given their socially-ascribed roles as primary caregivers and household managers, than those faced by men in low- and middle-income countries.

The results in Columns 2 and 3 show the magnitude of the association between food insecurity and migration intentions is consistently higher among men across each severity category. Interestingly, the results in Column 2 show that for women, food insecurity is a significant determinant of migration intentions at each level of severity. This demonstrates that despite the various responsibilities that might keep women from intending to migrate (e.g., presence of young children, etc.), even the mildest category of food insecurity acts a significant push factor for potential migration.

Other individual and household characteristics are found to significantly influence migration intentions. Column 1 shows that the determinants of migration intentions depend significantly on the potential migrant's location. Holding all other characteristics constant, we find that living in a rural area is associated with a 2.8 percentage-point lower probability of intending to migrate, and living in an urban area is associated with a 2.5 percentage-point higher probability of intending to migrate, compared to those living in the suburbs. A plausible explanation for this is that urban individuals are likely to have better access to employment opportunities in destination countries. We find evidence that being young and single increases the likelihood of having

migration intentions, whereas being married is associated with a 5.8 percentage-point lower probability of intending to migrate, compared to being single. We find that having a post-secondary education is associated with a 5.8 percentage-point higher probability of intending to migrate, compared to having only an elementary education.

Migrant networks play a significant role in determining an individual's intention to migrate. For example, receiving help from outside the country is associated with an 8.4 percentage-point higher probability of intending to migrate, which suggests that access to networks in destination countries has a positive impact on migration intentions. However, an increase in domestic social networks reduces the probability of intending to migrate by 4.8 percentage points. This implies that more social networks in the country of origin reduces the intention to migrate; while more social networks outside the country of origin increases the intention to migrate. These results reinforce previous research on the importance of migrant diasporas²³ and education²⁴ as push-factors of potential migration. Finally, we find that access to information technology significantly increases migration intentions, but at the country-level, we find that GDP per capita plays no significant role in determining migration intentions.

[Table 2 here]

Migration Decisions

²³ A major theme highlighted in the migration literature is the effect that migrant networks have on the decision to migrate (see e.g., Banerjee, 1983; Beine et al., 2011, 2015; Beine and Salomone, 2013; Manchin and Orazbayev, 2015; McKenzie and Rapoport, 2007; Munshi and Rosenzweig, 2016). International migrant networks (i.e., diasporas) should theoretically lower the cost of migration through the increased flow of income and information, e.g., having friends or family abroad encourages one's own desire or decision to move abroad (Docquier et al., 2014; Ruysen and Salomone, 2015).

²⁴ For example, the hypothesis of the "brain drain" phenomenon in the developing world, where the migration of highly skilled and/or well-educated individuals to richer countries for better pay, leads to a shortage of skills and human capital in their countries of origin (Docquier and Rapoport, 2012)

Table 3 provides the regression results for the determinants of migration decisions, for those with stated migration intentions. The top panel of the table provides the conditional average marginal effects for migration decisions, while the bottom panel provides the selection average marginal effects for migration intentions.²⁵ The results in the top panel indicate that the relationship between food insecurity and migration decisions is statistically significant, confirming the H4 hypothesis. In each column, moderate and severe food insecurity is associated with a significant decrease in the probability of migration decisions; but mild food insecurity is statistically insignificant for the female sample. We also find that the relationship between food insecurity and migration decisions is not necessarily monotonic; where in the female sample, the coefficient associated with moderate food insecurity is slightly higher than for the severe food insecurity category. However, the coefficients associated with both moderate and severe food insecurity are much larger than those for the mild food insecurity category in each sample. These findings are consistent with the H5 hypothesis that the likelihood of deciding to migrate is determined by the severity of food insecurity. Column 1 shows that being both severely food insecure and moderately food insecure is associated with a 12.0 percentage-point lower probability of deciding to migrate, respectively.

For the total sample (Column 1), we find no evidence that migration decisions depend significantly on the migrant's gender. However, Columns 2 and 3 show a more detailed gender-sensitive analysis by decomposing the sample by gender. Comparing Columns 2 and 3, we see that the magnitude of the association between food insecurity and migration decisions is consistently higher among women for both moderate and severe food insecurity. This is the opposite of what

²⁵ See Appendix C (Table C1) for the full results presented in odds ratios for the binary-choice model with sample selection. For example, in these tables we see that the selection parameter ρ is statistically significant for each sample, justifying the need for the sample-selection model.

was found for migration intentions, where men have higher magnitudes of association. We also find that in Column 2, mild food insecurity is not statistically significant for women, but is for men in Column 3. This suggests that given the relatively low bargaining power of women in the majority of households in low- and middle-income countries and the higher psychic costs faced by women and their households in terms of deviating from traditional gender roles, food insecurity is not a significant determinant of their migration decisions until it becomes severe enough. For men, on the other hand, any type of food insecurity acts as a significant driver of migration decisions.

We also find evidence that the determinants of migration decisions depend significantly on whether the potential migrant lives in a rural area; but not in an urban area (Column 1). Holding all other characteristics constant, we find that living in a rural area is associated with a 4.4 percentage-point higher probability of deciding to migrate, compared to those living in the suburbs. A plausible explanation for this is that those in urban areas may have weaker social ties and support networks in times of hardship than those in rural areas.

Additionally, Column 1 shows that having a secondary and post-secondary education is associated with a 4.9 and 5.8 percentage-point higher probability of deciding to migrate, respectively. This is consistent with previous research. For example, Docquier et al. (2014) find that individuals with college degrees have greater migration rates mainly due to their better chances in realizing their income potentials. Interestingly, we find that household income plays no significant role in determining migration decisions from low- and middle-income countries.²⁶ However, similar to migration intentions, migrant networks play a significant role in determining an individual's decision to migrate. For example, receiving help from outside the country is associated with a 16.8 percentage-point higher probability of deciding to migrate. This represents

²⁶ We find similar insignificant results using a logged continuous version of the household income measure.

the largest magnitude of association of the determinants of migration decisions. Finally, we find that access to information technology significantly increases migration decisions, but at the country-level, we find that GDP per capita and unemployment rates play no significant role in determining migration decisions.

[Table 3 here]

Macro-level Factors and Shocks

Tables 4 examines the possible impact of various macro-level (or country) characteristics and shocks on the relationship between food insecurity, gender, and migration decisions. In Columns 1 through 6 we find that including additional macro-level control variables does not significantly alter the relationship between food insecurity and migration decisions. In Column 1 we include a measure of political regime taken from the Polity IV database, where autocracy is the reference category. We find that individuals living under an anocracy²⁷ are less likely to decide to migrate; about 11.7 percentage points less than individuals living under an autocracy. Similarly, we find that individuals living under a democracy have a 13.4 percentage-point lower probability of deciding to migrate, than those living under an autocracy. These results show that migration decisions generally decline as democracy increases; which may indicate that people tend to want to stay put in more democratic countries.

In Column 2 we include a measure of ethnic fragmentation, also taken from the Polity IV database. We find that individuals living in a country with slight ethnic fragmentation decide to migrate 12.3 percentage points more than individuals living in a country with no ethnic fragmentation. Additionally, while moderate ethnic fragmentation is statistically insignificant, we find that individuals living under severe ethnic fragmentation have a 5.6 percentage-point higher

²⁷ An anocracy is a government regime with inherent instability and ineffectiveness. This regime type generally has a mix of democratic and autocratic traits and is particularly susceptible to political unrest (Jagers and Marshall 2013).

probability of deciding to migrate, than those living in a country with no ethnic fragmentation. These results imply that living in areas ruled by local authority and separated from a central government increases migration decisions. This suggests the presence of an adequate government safety-net can reduce out-migration in low- and middle-income countries.

In Columns 3 and 4 we include measures of ethnic and civil violence, taken from the Major Episodes of Political Violence (MEPV) database. We find that living in countries with ethnic political violence is associated with a 1.4 percentage-point increase in the decision to migrate (Column 3). Similarly, we find that living in countries with civil political violence is associated with a 1.0 percentage-point increase in the decision to migrate (Column 4). These results come as no surprise, but what is noteworthy is that the relationship between food insecurity and migration decisions has stayed consistent. In Columns 5 and 6 we include measures of natural disaster occurrences and percent-affected by natural disasters, taken from the Emergency Events Database (EM-DAT) from the Centre for Research on the Epidemiology of Disasters (CRED). We find that neither measure has a statistically significant relationship with the decision to migrate. Overall, Table 4 shows a consistent relationship between food insecurity and migration decisions across macro-level factors and shocks; where international migration decisions from individuals in low- and middle-income countries are an increasing (although not monotonically) function of food insecurity.

[Table 4 here]

Heterogeneity by Global Regions and Rankings of Economic Development

Finally, we examine if the relationship between food insecurity and migration decisions vary across global regions, as well as rankings of economic development (Table 5). Columns 1 through 5 represent the sample decomposed into five global regions: East Asia and the Pacific;

Europe and Central Asia; Latin America and the Caribbean; Middle East and North Africa; and Sub-Saharan Africa.²⁸ Columns 6 and 7 represent the sample decomposed into low- and middle-income countries. Interestingly, only moderate food insecurity is found to be statistically significant across all global regions, except for East Asia and the Pacific. Comparing the results across regions, we find that the association between moderate food insecurity and migration decisions is highest in Europe and Central Asia. For example, moderate food insecurity is associated with a decrease in the probability of migration decisions by 16.0 percentage points in Europe and Central Asia, holding all other characteristics constant. We find that the association between mild food insecurity and migration decisions is not significant for any individual global region, except for Sub-Saharan Africa. We also find significant differences in migration decisions by gender among Europe and Central Asia and Sub-Saharan Africa. Overall, Columns 1 through 5 show a significant relationship between moderate food insecurity and migration decisions. However, since there is large variation in countries within each global region, we further decompose the sample by economic development ranking (Columns 6 and 7).

In Columns 6 and 7, we see significant differences between low-income and middle-income countries. We find no statistically significant relationship between food insecurity (or gender) and migration decisions in low-income countries (Column 6). However, for middle-income countries (Column 7), we find that both moderate and severe food insecurity are associated with a lower probability of deciding to migrate. However, looking at the bottom panel at the average marginal effects for migration intentions, the coefficients on food insecurity (and gender) are statistically significant for individuals in both low- and middle-income countries. These results imply that while the intentions to migrate in low-income countries are strongly present, they are

²⁸ See Appendix E for a list of countries in each region.

unlikely to be able to afford to make the subsequent migration decision. Where those is middle-income countries are more likely to afford to do so.

Robustness Checks

This section runs a series of robustness checks to account for possible omitted variables, possible endogeneity stemming from measurement error of the dependent variables, and conducts several robustness checks on the sample-selection model used for migration decisions. Results are presented in Tables 6 and 7.

First, in Table 6 we control for time-invariant unobserved country-level characteristics that are also likely to influence decisions regarding migration such as economic growth prospects, social norms, presence of government safety-net programs addressing food security issues, as well as government policies intended to promote international migration. We use country fixed effects to take this into account. Column 1 presents the results of a country fixed effects model for migration intentions. Column 3 presents the results from a country fixed effects model for migration decisions. Again, in both cases, we find very similar results to the previous results using the hierarchical linear and sample-selection models.

Next, we conduct additional analyses to control for the possible measurement error of the dependent variables. Measurement error might stem from the fact that the sample includes previously arrived migrants (Ruysen and Salomone, 2015). Former migrants might be more likely to migrate again soon. To test the sensitivity of the results to the inclusion of previous migrants we re-estimate the model excluding them from the sample; thus, keeping only respondents who were born in country. Column 2 presents the results of the hierarchical linear model on migration intentions for native-born adults only. Column 4 and 5 presents the results for migration decisions, exclusively for the native-born. The conditional average marginal effects on migration decisions

in Column 4 and the selection average marginal effects on migration intentions in Column 5. In both cases, we find virtually no differences between the native-born only sample and the total sample which includes previous migrants.

Third, as a sensitivity check on *Migration Decisions*, we examine the relationship between food insecurity and an additional dependent variable, *Migration Plans*. This is a binary variable that equals one if the individual has concrete international migration plans to move in the next 12 months; zero otherwise. Only respondents with migration intentions were asked about their migration plans. Column 6 of Table 6 presents the results from the hierarchical linear model on *Migration Plans*, and we see similar results to migration decisions. Table 7 shows the results from the binary-choice model with sample selection for *Migration Plans*, with the selection being on stated migration intentions. We see that food insecurity is generally not associated with the probability of having migration plans across selected samples. However, migration plans represent an intermediate step between the intention and decision of migration.

In all robustness and sensitivity checks, we find that the relationship between food insecurity, gender, and migration behavior does not change. The magnitude and significance of the food insecurity coefficients remain relatively the same; and gender remains negatively associated with migration intentions, but statistically insignificant to migration decisions. Thus, the results are found to be robust across model specifications and chosen variables.

[Table 6 here]

Conclusion

People in low- and middle-income countries are increasingly using migration to meet their basic needs. While the determinants of migration have been widely studied, there has been limited research examining food insecurity as a push-factor of migration. Additionally, the gender

dimension of migration determinants has been broadly understudied and overlooked. There has been increased attention at the international policy level on reducing food insecurity around the world and meeting the Sustainable Development Goal (SDG) targets, but there remains a great need for additional research into how food insecurity affects migration behavior and how this relationship is influenced by gender.

This paper makes several contributions to the migration literature. First, we develop a two-stage analytical framework that: First, demonstrates the relationship between food insecurity and migration intentions at the individual level and examines its gender dimension; and second, examines the factors that influence migration decisions using a household semi-cooperative model. We show that the relationship between food insecurity and migration behavior is *ex ante* ambiguous, and depends upon the severity of food insecurity and the sum of the individual's migration costs. Additionally, we demonstrate that the relationship between food insecurity and migration intentions and subsequent decisions depends crucially on gender household dynamics. We then empirically test whether food insecurity and gender, alongside individual, household, and country characteristics, influence an individual's international migration intentions and subsequent migration decisions. The analyses involve a series of hierarchical linear and binary-choice models with sample-selection using data from the 2014-2015 waves of the Gallup World Poll, which includes the first global measure of individual-level food insecurity. The results, which are found to be robust, indicate that food insecurity is an important determinant of both migration intentions and migration decisions; where the likelihood of international migration intentions increases monotonically with the severity of food insecurity, and the likelihood of international migration decisions decreases with the severity of food insecurity. We also find that these relationships vary significantly by gender.

Sensitivity analyses indicate that the results are robust to various model assumptions and variable definitions; however, there are limitations worth discussing. First, causality cannot be inferred from the results, since potential endogeneity between migration behavior and food insecurity remains a concern. However, the results do suggest the presence of strong correlations between food insecurity, gender, and migration intentions and subsequent decisions. Understanding these correlations is an important first step. Further work should extend the analyses here to address potential endogeneity. For example, innate ability, ambition, and risk aversion all likely play an unobservable role in both the individual's food security status and migration decision-making process. Second, the analyses are limited by the information available in the Gallup World Poll. For example, for the selected sample we do not have information on the destination choices of potential migrants, and are thus, unable to control for additional characteristics known to be related to migration decisions, such as the unique immigration policies in destination countries.

The findings in this paper are particularly relevant given that the rate of female migration over the last several decades has increased significantly. In the absence of social protection and effective anti-poverty policies, households in developing countries will resort to migration as a major coping strategy to address food insecurity. This has potentially important policy implications due to the increasing concern on reducing global hunger to achieve the Sustainable Development Goal (SDG) targets. Results suggest the need for increased coordination between international food security and migration policy agendas.

References

- Ballard, T. J., Kepple, A. W., and Cafiero, C. (2013). The Food Insecurity Experience Scale: Development of a Global Standard for Monitoring Hunger Worldwide.
- Banerjee, B. (1983). Social networks in the migration process: empirical evidence on chain migration in India. *The journal of developing areas*, 17(2), 185-196.
- Baudassé, T., and Bazillier, R. (2014). Gender inequality and emigration: Push factor or selection process? *International Economics*, 139, 19-47.
- Beine, M., Docquier, F., and Özden, Ç. (2011). Diasporas. *Journal of Development Economics*, 95(1), 30-41.
- Beine, M., and Salomone, S. (2013). Network effects in international migration: education versus gender. *The Scandinavian journal of economics*, 115(2), 354-380.
- Beine, M., Docquier, F., and Özden, Ç. (2015). Dissecting network externalities in international migration. *Journal of Demographic Economics*, 81(04), 379-408.
- Bertoli, S., and Ruysen, I. (2016). Networks and Migrants' Intended Destination. *IZA Discussion Paper*.
- Borjas, G. J. (1987). Self-selection and the earnings of immigrants: National Bureau of Economic Research Cambridge, Mass., USA.
- Borjas, G. J., and Katz, L. F. (2007). *The evolution of the Mexican-born workforce in the United States*. Paper presented at the Mexican immigration to the United States.
- Broussard, N. H. (2012). Food aid and adult nutrition in rural Ethiopia. *Agricultural Economics*, 43(1), 45-59.
- Broussard, N. H. (2016). What Explains Gender Differences in Food Insecurity? *Economic Research Service, USDA. Working paper*.
- Cafiero, C., Melgar-Quinonez, H. R., Ballard, T. J., and Kepple, A. W. (2014). Validity and reliability of food security measures. *Ann N Y Acad Sci*, 1331, 230-248.
doi:10.1111/nyas.12594
- Cai, R., Esipova, N., Oppenheimer, M., and Feng, S. (2014). International migration desires related to subjective well-being. *IZA Journal of Migration*, 3(1), 1.
- Cameron, A. C., and Trivedi, P. K. (2005). *Microeconometrics: methods and applications*: Cambridge university press.

- Castles, S., De Haas, H., and Miller, M. J. (2013). *The age of migration: International population movements in the modern world*: Palgrave Macmillan.
- Chort, I. (2014). Mexican Migrants to the US: What Do Unrealized Migration Intentions Tell Us About Gender Inequalities? *World Development*, 59, 535-552.
- Clark, X., Hatton, T. J., and Williamson, J. G. (2002). *Where do US immigrants come from, and why?* Retrieved from
- Clark, X., Hatton, T. J., and Williamson, J. G. (2007). Explaining US immigration, 1971-1998. *The Review of Economics and Statistics*, 89(2), 359-373.
- Coates, J., Frongillo, E. A., Rogers, B. L., Webb, P., Wilde, P. E., and Houser, R. (2006). Commonalities in the experience of household food insecurity across cultures: what are measures missing? *The Journal of Nutrition*, 136(5), 1438S-1448S.
- Coates, J., Swindale, A., and Bilinsky, P. (2007). Household Food Insecurity Access Scale (HFIAS) for measurement of food access: indicator guide. *Washington, DC: Food and Nutrition Technical Assistance Project, Academy for Educational Development*.
- Coates, J. (2013). Build it back better: deconstructing food security for improved measurement and action. *Global food security*, 2(3), 188-194.
- Cole, B. R., and Marshall, M. G. (2014). Global Report 2014: Conflict, Governance and State Fragility. *Center for Systematic Peace*.
- Cortes, P. (2015). The feminization of international migration and its effects on the children left behind: Evidence from the Philippines. *World Development*, 65, 62-78.
- Creighton, M. J., and Riosmena, F. (2013). Migration and the gendered origin of migrant networks among couples in Mexico. *Social Science Quarterly*, 94(1), 79-99.
- Crush, J. (2013). Linking food security, migration and development. *International Migration*, 51(5), 61-75.
- Czaika, M., and Vothknecht, M. (2014). Migration and aspirations—are migrants trapped on a hedonic treadmill? *IZA Journal of Migration*, 3(1), 1-21.
- Deere, C. D., and Doss, C. R. (2006). The gender asset gap: What do we know and why does it matter?. *Feminist Economics*, 12(1-2), 1-50.
- Docquier, F., Marfouk, A., Salomone, S., and Sekkat, K. (2012). Are skilled women more migratory than skilled men? *World Development*, 40(2), 251-265.
- Docquier, F., and Rapoport, H. (2012). Globalization, brain drain, and development. *Journal of economic literature*, 50(3), 681-730.

- Docquier, F., Peri, G., and Ruysen, I. (2014). The Cross-country Determinants of Potential and Actual Migration. *International migration review*, 48(s1), S37-S99.
- Docquier, F., Tanselb, A., and Turatic, R. (2017) Do emigrants self-select along cultural traits? Evidence from the MENA countries. *Working paper*.
- Donato, Katharine M., and Donna Gabaccia. (2015). *Gender and international migration*. Russell Sage Foundation, New York.
- Doss, C., Summerfield, G., and Tsikata, D. (2014). *Land, gender and food security, Feminist Economics*, Vol. 20 (1).
- Dustmann, C., and Okatenko, A. (2014). Out-migration, wealth constraints, and the quality of local amenities. *Journal of Development Economics*, 110, 52-63.
- Erlinghagen, M. (2012). Nowhere better than here? The subjective well-being of German emigrants and remigrants. *Comparative Population Studies*, 36(4).
- FAO. (2009). Declaration of the World Summit on Food Security. *FAO, Rome, World Summit on Food Security*.
- FAO. (2015). The State of Food Insecurity in the World 2015. Meeting the 2015 international hunger targets: taking stock of uneven progress.
- FAO. (2016). Methods for estimating comparable rates of food insecurity experienced by adults throughout the world. *Rome, FAO*.
- Floro, Maria Sagrario, and Ranjula Bali Swain. (2013). Food security, gender, and occupational choice among urban low-income households. *World Development* 42, 89-99.
- Frongillo, E. A., and Nanama, S. (2006). Development and validation of an experience-based measure of household food insecurity within and across seasons in northern Burkina Faso. *The Journal of Nutrition*, 136(5), 1409S-1419S.
- Frongillo, E. A., Nguyen, H. T., Smith, M. D., and Coleman-Jensen, A. (2017). Food Insecurity Is Associated with Subjective Well-Being among Individuals from 138 Countries in the 2014 Gallup World Poll. *The Journal of Nutrition*, 147(4), 680-687.
- Gammage, Sarah and Natacha Stevanovic (2016). Gender, Migration , Work and Care Deficits: What Role is there for the SDGs? Paper presented at the Commission on the Status of Women (CSW61) Expert Group Meeting on Women’s Economic Empowerment in the Changing World of Work, Sept 26-28, 2016, International Labour Office, Geneva.
- Gelman, A., and Hill, J. (2007). *Data analysis using regression and hierarchical/multilevel models*: Cambridge University Press: Cambridge, UK.

- Goldstein, H. (2011). *Multilevel statistical models* (Vol. 922): John Wiley and Sons.
- Grogger, J., and Hanson, G. H. (2011). Income maximization and the selection and sorting of international migrants. *Journal of Development Economics*, 95(1), 42-57.
- Harris, J. R., and Todaro, M. P. (1970). Migration, unemployment and development: a two-sector analysis. *The American Economic Review*, 126-142.
- Hatton, T. J., and Williamson, J. G. (2005). What fundamentals drive world migration? *Poverty, international migration and asylum* (pp. 15-38): Springer.
- Hunt, J. (2006). Staunching emigration from East Germany: Age and the determinants of migration. *Journal of the European Economic Association*, 4(5), 1014-1037.
- ILO (2015). *World Employment and Social Outlook: Trends 2015*: International Labour Organization.
- Ivlevs, A. (2013). Minorities on the move? Assessing post-enlargement emigration intentions of Latvia's Russian speaking minority. *The Annals of Regional Science*, 51(1), 33-52.
- Ivlevs, A. (2014). Happiness and the emigration decision. *IZA World of Labor*.
- Ivlevs, A. (2015). Happy moves? Assessing the link between life satisfaction and emigration intentions. *Kyklos*, 68(3), 335-356.
- Jones, A. D., Ngure, F. M., Pelto, G., and Young, S. L. (2013). What are we assessing when we measure food security? A compendium and review of current metrics. *Advances in Nutrition: An International Review Journal*, 4(5), 481-505.
- Kanaiaupuni, S. M. (2000). Reframing the migration question: An analysis of men, women, and gender in Mexico. *Social Forces*, 78(4), 1311-1347.
- Laczko, F., and Appave, G. (2015). *World Migration Report 2013: Migrant Well-Being and Development*.
- Long, K., and Rosengaertner, S. (2016). *Protection through Mobility: Opening Labor and Study Migration Channels to Refugees*: Washington, DC: Migration Policy Institute.
- Lovo, S. (2014). Potential migration and subjective well-being in Europe. *IZA Journal of Migration*, 3(1), 1.
- Manchin, M., and Orazbayev, S. (2015). Social networks and the intention to migrate. *Working paper*.

- Marques, E. S., Reichenheim, M. E., de Moraes, C. L., Antunes, M. M., and Salles-Costa, R. (2015). Household food insecurity: a systematic review of the measuring instruments used in epidemiological studies. *Public Health Nutr*, 18(5), 877-892.
- Marshall, M., and Jaggers, K. (2016). Polity IV database. *Online Database. Available at <http://www.systemicpeace.org/polity/polity4.htm>*.
- Massey, D. S., Arango, J., Hugo, G., Kouaouci, A., Pellegrino, A., and Taylor, J. E. (1993). Theories of international migration: A review and appraisal. *Population and Development Review*, 431-466.
- Mayda, A. M. (2010). International migration: A panel data analysis of the determinants of bilateral flows. *Journal of Population Economics*, 23(4), 1249-1274.
- McKenzie, D., and Rapoport, H. (2007). Network effects and the dynamics of migration and inequality: theory and evidence from Mexico. *Journal of Development Economics*, 84(1), 1-24.
- McGuirk, E., and Burke, M. (2017). The Economic Origins of Conflict in Africa. Retrieved from NBER.
- Meinzen-Dick, R., Johnson, N., Quisumbing, A. R., Njuki, J., Behrman, J. A., Rubin, D., Peterman, A., and Waithanji, E. (2014). The gender asset gap and its implications for agricultural and rural development. In *Gender in Agriculture* (pp. 91-115). Springer Netherlands.
- Munshi, K. (2014). Community networks and the process of development. *The Journal of Economic Perspectives*, 28(4), 49-76.
- Munshi, K. (2016). Migration, Institutions and Development.
- Munshi, K., and Rosenzweig, M. (2016). Networks and misallocation: Insurance, migration, and the rural-urban wage gap. *The American Economic Review*, 106(1), 46-98.
- Nikolova, M., and Graham, C. (2015). In transit: The well-being of migrants from transition and post-transition countries. *Journal of Economic Behavior and Organization*, 112, 164-186.
- Nikolova, M., and Graham, C. (2015). Well-being and Emigration Intentions: New Evidence from the Gallup World Poll. *Working paper*.
- Nord, M. (2002). *A 30-day food security scale for Current Population Survey Food Security Supplement data*: US Department of Agriculture, Economic Research Service Washington, DC.
- Nord, M. (2014). Introduction to Item Response Theory applied to Food Security Measurement Basic Concepts, Parameters, and Statistics.

- Nord, M., Cafiero, C., and Viviani, S. (2016). Methods for estimating comparable prevalence rates of food insecurity experienced by adults in 147 countries and areas. In *Journal of Physics: Conference Series* (Vol. 772, No. 1, p. 012060). IOP Publishing.
- Ortega, F., and Peri, G. (2009). *The causes and effects of international migrations: Evidence from OECD countries 1980-2005*. Retrieved from
- Paul, A. M. (2011). Stepwise International Migration: A Multistage Migration Pattern for the Aspiring Migrant1. *American Journal of Sociology*, 116(6), 1842-1886.
- Perez-Escamilla, R. (2012). Can experience-based household food security scales help improve food security governance? *Global food security*, 1(2), 120-125.
- Petrozziello, A. J. (2013). *Gender on the Move: Working on the migration-development nexus from a gender perspective*.
- Radimer, K. L., Olson, C. M., and Campbell, C. C. (1990). Development of indicators to assess hunger. *The Journal of Nutrition*, 120, 1544-1548.
- Radimer, K. L., Olson, C. M., Greene, J. C., Campbell, C. C., and Habicht, J.-P. (1992). Understanding hunger and developing indicators to assess it in women and children. *Journal of Nutrition Education*, 24(1), 36S-44S.
- Rasch, G. (1960). Studies in mathematical psychology: I. Probabilistic models for some intelligence and attainment tests.
- Richter, S., and Taylor, J. E. (2007). Gender and the determinants of international migration from rural Mexico over time. *The International Migration of Women*, 51-99.
- Roy, A. D. (1951). Some thoughts on the distribution of earnings. *Oxford Economic Papers*, 3(2), 135-146.
- Ruyssen, I., and Salomone, S. (2015). Female Migration: A Way Out of Discrimination. *Working paper*.
- Schiff, M., and Morrison, A. R. (Eds.). (2007). *The international migration of women*. World Bank Publications.
- Sjaastad, L. A. (1962). The Costs and Returns of Human Migration. *Journal of political Economy*, 70(5, Part 2), 80-93.
- Smith, and Haddad, J. L. (2000). *Explaining child malnutrition in developing countries: A cross-country analysis* (Vol. 111): Intl Food Policy Res Inst.

- Smith, M. D., Kassa, W., and Winters, P. (2017b). Assessing Food Insecurity in Latin America and the Caribbean using FAO's Food Insecurity Experience Scale. *Food Policy*, 71, 48–61.
- Smith, M. D., Rabbitt, M. P., and Coleman-Jensen, A. (2017a). Who are the World's Food Insecure? New Evidence from the Food and Agriculture Organization's Food Insecurity Experience Scale. *World Development*, 93, 402-412.
- Sraboni, E., Malapit, H. J., Quisumbing, A. R., and Ahmed, A. U. (2014). Women's empowerment in agriculture: What role for food security in Bangladesh? *World Development*, 61, 11-52.
- Stark, O. (1978). *Economic-demographic interactions in agricultural development: the case of rural-to-urban migration* (Vol. 6): Food and Agriculture Org.
- Stark, O., and Taylor, J. E. (1989). Relative deprivation and international migration. *Demography*, 26(1), 1-14.
- Stillman, Steven, et al. (2015). "Miserable migrants? Natural experiment evidence on international migration and objective and subjective well-being." *World Development* 65: 79-93. <http://dx.doi.org/10.1016/j.worlddev.2013.07.003>
- Takenaka, A., and Pren, K. A. (2010). Leaving to Get Ahead Assessing the Relationship between Mobility and Inequality in Peruvian Migration. *Latin American Perspectives*, 37(5), 29-49.
- United Nations, Population Division. (2016). *International Migration Report 2015: Highlights* (Vol. (ST/ESA/SER.A/375)).
- Vargas-Silva, C. (2016). *Literature Review: Remittances Sent to and from Refugees and Internally Displaced Persons*. Retrieved from
- World Bank, (2016). GNI per capita, Atlas method from World Bank
- Zavodny, M. (1997). Welfare and the locational choices of new immigrants. *Economic Review-Federal Reserve Bank of Dallas*, 2.
- Zeza, A., Carletto, C., Davis, B., and Winters, P. (2011). Assessing the impact of migration on food and nutrition security. *Food Policy*, 36(1), 1-6.

Tables

Table 1. Coefficients and Standard Errors from HLM for the Determinants of Migration Intentions

Variables	Total sample	Female	Male
Mild food insecurity	0.049*** (0.003)	0.041*** (0.004)	0.058*** (0.005)
Moderate food insecurity	0.090*** (0.003)	0.079*** (0.004)	0.102*** (0.005)
Severe food insecurity	0.112*** (0.004)	0.100*** (0.005)	0.129*** (0.006)
Female	-0.038*** (0.002)		
Rural area	-0.027*** (0.003)	-0.023*** (0.004)	-0.033*** (0.004)
Large City	0.024*** (0.003)	0.027*** (0.004)	0.020*** (0.005)
Age	-0.004*** (0.001)	-0.003*** (0.001)	-0.005*** (0.001)
Age squared	-0.000 (0.000)	-0.000* (0.000)	0.000 (0.000)
Married or Domestic partner	-0.059*** (0.003)	-0.056*** (0.004)	-0.056*** (0.005)
Separated, Widowed, or Divorced	-0.037*** (0.005)	-0.034*** (0.006)	-0.032*** (0.009)
Secondary education	0.046*** (0.003)	0.050*** (0.004)	0.040*** (0.004)
Post-secondary education	0.058*** (0.005)	0.063*** (0.006)	0.052*** (0.007)
Employed full time for self	0.003 (0.004)	-0.000 (0.006)	0.003 (0.005)
Employed part time	0.029*** (0.004)	0.028*** (0.005)	0.027*** (0.006)
Unemployed	0.029*** (0.005)	0.020*** (0.007)	0.034*** (0.007)
Out of workforce	-0.013*** (0.003)	-0.014*** (0.005)	-0.009 (0.005)
Social network	-0.048*** (0.003)	-0.046*** (0.004)	-0.050*** (0.004)
Help outside	0.084*** (0.002)	0.091*** (0.003)	0.076*** (0.004)
Internet	0.026*** (0.003)	0.027*** (0.004)	0.025*** (0.005)
Television	0.020*** (0.004)	0.033*** (0.005)	0.006 (0.005)
Log GDP Per Capita (2010 US\$)	0.001 (0.011)	-0.006 (0.012)	-0.000 (0.012)
Constant	0.360*** (0.090)	0.335*** (0.095)	0.411*** (0.093)
<u>Error Components</u>			
σ_i^2	0.111*** (0.008)	0.114*** (0.009)	0.110*** (0.008)

Variables	Total sample	Female	Male
σ_{ic}^2	0.397*** (0.001)	0.383*** (0.001)	0.412*** (0.001)
Log likelihood	-61827.498	-30975.284	-30669.741
Number of Observations	124,198	66,950	57,248

Notes: Data source is GWP/FAO, 2014-15. Dependent variable is *Migration Intentions*. Coefficients are average marginal effects. Standard errors are in parentheses. Each regression also includes controls for year.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table 2. Coefficients and Standard Errors from Binary-Choice Model with Sample-Selection

Variables	Total sample	Female	Male
<u>Migration Decisions</u>			
Mild food insecurity	-0.043*** (0.017)	-0.037 (0.027)	-0.046* (0.025)
Moderate food insecurity	-0.120*** (0.020)	-0.133*** (0.032)	-0.107*** (0.025)
Severe food insecurity	-0.120*** (0.023)	-0.127*** (0.037)	-0.109*** (0.026)
Female	-0.014 (0.016)		
Rural area	0.047* (0.027)	0.078** (0.036)	0.028 (0.031)
Large City	-0.024 (0.016)	-0.010 (0.023)	-0.033* (0.019)
Age	0.015*** (0.005)	0.018*** (0.007)	0.014** (0.007)
Age squared	-0.000*** (0.000)	-0.000** (0.000)	-0.000** (0.000)
Number of adults	-0.003 (0.005)	0.004 (0.007)	-0.008 (0.006)
Number of children	0.001 (0.005)	-0.002 (0.008)	0.004 (0.006)
Married or Domestic partner	0.009 (0.020)	-0.008 (0.026)	0.016 (0.030)
Separated Widowed or Divorced	0.037 (0.031)	0.022 (0.040)	0.052 (0.048)
Secondary education	0.049** (0.022)	0.079*** (0.028)	0.023 (0.030)
Post-secondary education	0.097*** (0.027)	0.142*** (0.043)	0.062** (0.031)
Employed full time for self	-0.028 (0.025)	-0.010 (0.039)	-0.038 (0.035)
Employed part time	-0.003 (0.024)	-0.009 (0.032)	0.017 (0.034)
Unemployed	-0.013 (0.027)	-0.006 (0.044)	-0.012 (0.034)
Out of workforce	-0.026 (0.022)	0.011 (0.031)	-0.065* (0.035)
Household Income-Second 20%	-0.007 (0.026)	-0.054 (0.039)	0.039 (0.036)
Household Income-Middle 20%	-0.016 (0.030)	-0.056 (0.034)	0.019 (0.043)
Household Income-Fourth 20%	-0.008 (0.027)	-0.007 (0.039)	-0.002 (0.037)
Household Income-Richest 20%	0.034 (0.027)	0.004 (0.032)	0.065 (0.042)
Social networks	-0.013 (0.021)	0.006 (0.027)	-0.032 (0.027)
Help outside	0.167*** (0.021)	0.213*** (0.028)	0.138*** (0.026)

Variables	Total sample	Female	Male
Access to internet	0.095*** (0.020)	0.072** (0.029)	0.111*** (0.024)
Home has television	0.023 (0.022)	0.015 (0.033)	0.027 (0.027)
Public transportation access	0.008 (0.016)	0.006 (0.025)	0.011 (0.019)
Log GDP Per Capita (2010 US\$)	0.022 (0.017)	0.016 (0.021)	0.029 (0.018)
National unemployment	-0.000 (0.002)	-0.002 (0.002)	0.002 (0.003)
<u>Migration Intentions</u>			
Mild food insecurity	0.012*** (0.002)	0.010*** (0.002)	0.014*** (0.004)
Moderate food insecurity	0.031*** (0.005)	0.025*** (0.004)	0.039*** (0.006)
Severe food insecurity	0.056*** (0.007)	0.047*** (0.007)	0.069*** (0.009)
Female	-0.015*** (0.002)		
Rural or farm	-0.013*** (0.003)	-0.008*** (0.002)	-0.019*** (0.003)
Large City	0.015*** (0.003)	0.014*** (0.003)	0.016*** (0.005)
Age	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.001)
Age squared	-0.000*** (0.000)	-0.000 (0.000)	-0.000*** (0.000)
Married or Domestic partner	-0.017*** (0.003)	-0.013*** (0.003)	-0.021*** (0.004)
Separated Widowed or Divorced	-0.003 (0.004)	-0.004 (0.004)	0.002 (0.006)
Secondary education	0.011*** (0.003)	0.010*** (0.003)	0.011*** (0.003)
Post-secondary education	0.019*** (0.004)	0.018*** (0.004)	0.019*** (0.005)
Employed full time for self	0.004** (0.002)	0.001 (0.003)	0.007** (0.003)
Employed part time	0.018*** (0.003)	0.012*** (0.003)	0.025*** (0.005)
Unemployed	0.016*** (0.003)	0.006** (0.003)	0.027*** (0.005)
Out of workforce	0.001 (0.002)	-0.002 (0.002)	0.005 (0.003)
Social networks	-0.019*** (0.003)	-0.014*** (0.003)	-0.026*** (0.004)
Help outside	0.050*** (0.005)	0.044*** (0.005)	0.057*** (0.005)
Access to internet	0.010***	0.010***	0.010**

Variables	Total sample	Female	Male
	(0.003)	(0.003)	(0.004)
Home has television	0.003	0.003	0.004
	(0.003)	(0.003)	(0.004)
Log GDP Per Capita (2010 US\$)	-0.007**	-0.006**	-0.008**
	(0.003)	(0.003)	(0.004)
Number of observations	98,613	54,164	44,449

Notes: Data source is GWP/FAO, 2014-15. Coefficients are Average Marginal Effects. Standard errors are in parentheses. Each regression also includes controls for year.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table 3. Macro-level Characteristics and Shocks: Coefficients and Standard Errors from Binary-Choice Model with Sample-Selection

Variables	Regime Type	Ethnic fragmentation	Ethnic Violence	Civil Violence	Natural Disaster Occurrences	% Affected by Natural Disasters
<u>Migration Decisions</u>						
Mild food insecurity	-0.041** (0.017)	-0.046*** (0.016)	-0.046*** (0.017)	-0.046*** (0.017)	-0.025 (0.022)	-0.018 (0.022)
Moderate food insecurity	-0.118*** (0.020)	-0.120*** (0.020)	-0.122*** (0.020)	-0.123*** (0.020)	-0.100*** (0.023)	-0.089*** (0.022)
Severe food insecurity	-0.120*** (0.023)	-0.119*** (0.023)	-0.120*** (0.023)	-0.122*** (0.023)	-0.098*** (0.032)	-0.091*** (0.034)
Female	-0.013 (0.017)	-0.014 (0.017)	-0.013 (0.016)	-0.012 (0.016)	-0.006 (0.020)	-0.008 (0.020)
Rural area	0.045 (0.028)	0.041 (0.025)	0.047* (0.027)	0.047* (0.026)	0.047* (0.028)	0.042 (0.029)
Large City	-0.028 (0.017)	-0.028* (0.016)	-0.026 (0.016)	-0.028* (0.016)	-0.026 (0.021)	-0.026 (0.021)
Log GDP Per Capita (2010 US\$)	0.025 (0.019)	0.033* (0.018)	0.026 (0.017)	0.027 (0.017)	0.024 (0.019)	0.026 (0.019)
National unemployment	-0.000 (0.003)	-0.000 (0.003)	-0.001 (0.003)	-0.000 (0.002)	0.001 (0.002)	0.001 (0.003)
Anocracy	-0.126** (0.050)					
Democracy	-0.140*** (0.045)					
Slight ethnic fragmentation		0.127*** (0.040)				
Moderate ethnic fragmentation		0.100 (0.061)				
Serious ethnic fragmentation		0.061* (0.033)				
Magnitude of ethnic violence			0.014** (0.006)			
Magnitude of civil violence				0.010* (0.006)		
Natural Disaster Occurrence					-0.004 (0.004)	

Variables	Regime Type	Ethnic fragmentation	Ethnic Violence	Civil Violence	Natural Disaster Occurrences	% Affected by Natural Disasters
Percentage Total Affected by Natural Disaster						-0.000 (0.001)
<u>Migration Intentions</u>						
Mild food insecurity	0.012*** (0.002)	0.012*** (0.002)	0.012*** (0.002)	0.012*** (0.002)	0.009*** (0.002)	0.009*** (0.002)
Moderate food insecurity	0.031*** (0.005)	0.031*** (0.005)	0.031*** (0.005)	0.031*** (0.005)	0.021*** (0.004)	0.020*** (0.004)
Severe food insecurity	0.055*** (0.007)	0.056*** (0.007)	0.056*** (0.007)	0.056*** (0.007)	0.036*** (0.007)	0.035*** (0.007)
Female	-0.014*** (0.002)	-0.014*** (0.002)	-0.014*** (0.002)	-0.014*** (0.002)	-0.009*** (0.002)	-0.009*** (0.002)
Rural or farm	-0.012*** (0.003)	-0.012*** (0.003)	-0.012*** (0.003)	-0.012*** (0.003)	-0.007*** (0.002)	-0.007*** (0.002)
Large City	0.014*** (0.004)	0.014*** (0.004)	0.014*** (0.004)	0.014*** (0.004)	0.009*** (0.003)	0.009*** (0.003)
Log GDP Per Capita (2010 US\$)	-0.007** (0.003)	-0.007** (0.003)	-0.007** (0.003)	-0.007** (0.003)	-0.003 (0.003)	-0.003 (0.003)
Number of observations	95,528	96,943	96,943	96,943	69,151	67,092

Notes: Data source is GWP/FAO, 2014-15. Coefficients are average marginal effects. Standard errors are in parentheses. Each regression also includes controls for year.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table 4. Global Regions and Rankings of Economic Development: Coefficients and Standard Errors from Binary-Choice Model with Sample-Selection

Variables	Global Regions					Rankings of Economic Development	
	East Asia, & Pacific	Europe & Central Asia	Latin America & Caribbean	Middle East & North Africa	Sub-Saharan Africa	Low-income Countries	Middle-income Countries
<u>Migration Decisions</u>							
Mild food insecurity	-0.123 (0.094)	-0.033 (0.048)	0.016 (0.034)	0.068 (0.049)	-0.047** (0.022)	0.019 (0.042)	-0.026 (0.031)
Moderate food insecurity	-0.006 (0.109)	-0.160** (0.063)	-0.083** (0.035)	-0.115** (0.054)	-0.084*** (0.027)	-0.023 (0.045)	-0.104*** (0.034)
Severe food insecurity	0.045 (0.251)	-0.109** (0.049)	-0.018 (0.057)	-0.184* (0.100)	-0.092*** (0.023)	-0.012 (0.040)	-0.112*** (0.042)
Female	0.026 (0.031)	0.069* (0.039)	0.000 (0.035)	-0.069 (0.056)	-0.029* (0.015)	0.017 (0.029)	-0.042 (0.029)
Rural area	0.012 (0.110)	0.067 (0.078)	0.022 (0.045)	-0.130*** (0.034)	0.006 (0.022)	-0.011 (0.032)	0.064* (0.038)
Large City	0.047 (0.036)	-0.018 (0.052)	-0.051 (0.038)	0.016 (0.048)	-0.018 (0.017)	-0.037* (0.020)	-0.002 (0.028)
<u>Migration Intentions</u>							
Mild food insecurity	0.002*** (0.000)	0.008** (0.004)	0.014*** (0.004)	0.009 (0.009)	0.015*** (0.004)	0.015*** (0.005)	0.007*** (0.002)
Moderate food insecurity	0.006*** (0.002)	0.023** (0.009)	0.033*** (0.007)	0.029** (0.014)	0.031*** (0.008)	0.021** (0.010)	0.019*** (0.004)
Severe food insecurity	0.008 (0.006)	0.045** (0.019)	0.052*** (0.013)	0.063** (0.029)	0.060*** (0.010)	0.027*** (0.010)	0.039*** (0.008)
Female	0.000 (0.002)	-0.009*** (0.003)	-0.010*** (0.003)	-0.033*** (0.006)	-0.018*** (0.004)	-0.014*** (0.004)	-0.008*** (0.002)
Rural or farm	-0.003* (0.002)	-0.010 (0.007)	-0.004 (0.003)	-0.013** (0.006)	-0.014*** (0.004)	-0.007* (0.004)	-0.006*** (0.002)
Large City	0.003** (0.001)	0.005* (0.003)	0.010* (0.006)	0.010* (0.006)	0.035*** (0.010)	0.019** (0.008)	0.007** (0.003)
Number of observations	9,902	29,234	15,686	11,043	32,748	19,612	77,027

Notes: Data source is GWP/FAO, 2014-15. Coefficients are average marginal effects. Standard errors are in parentheses. Each regression also includes controls for year.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table 5. Sensitivity Analysis: Coefficients and Standard Errors from HLM and Binary-Choice Model with Sample-Selection

Variables	Migration Intentions		Migration Decisions		Migration Plans	
	Country Fixed Effects	Native-Born Only	Country Fixed Effects	Conditional Average Marginal Effects on Migration Decisions - Native-Born Only	Selection Average Marginal Effects on Migration Intentions - Native-Born Only	HLM (Total Sample)
Mild food insecurity	0.047*** (0.003)	0.048*** (0.003)	-0.027 (0.019)	-0.047*** (0.017)	0.012*** (0.002)	0.003 (0.006)
Moderate food insecurity	0.087*** (0.003)	0.089*** (0.003)	-0.084*** (0.019)	-0.120*** (0.020)	0.030*** (0.005)	0.018*** (0.006)
Severe food insecurity	0.108*** (0.004)	0.111*** (0.004)	-0.086*** (0.021)	-0.118*** (0.023)	0.055*** (0.007)	0.069*** (0.007)
Female	-0.037*** (0.002)	-0.038*** (0.002)	-0.021 (0.014)	-0.012 (0.016)	-0.014*** (0.002)	-0.029*** (0.005)
Rural or farm	-0.030*** (0.003)	-0.028*** (0.003)	0.014 (0.018)	0.049* (0.027)	-0.012*** (0.003)	-0.004 (0.006)
Large City	0.025*** (0.003)	0.024*** (0.003)	-0.012 (0.016)	-0.025 (0.016)	0.014*** (0.003)	0.034*** (0.005)
Number of observations	124,198	121,113	5,011	96,332	96,332	29,224

Notes: Data source is GWP/FAO, 2014-15. Dependent variable is *Migration Intentions*. Coefficients are average marginal effects. Standard errors are in parentheses.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table 6. Sensitivity Analysis: Coefficients and Standard Errors from Binary-Choice Model with Migration Plans

Variables	Total sample	Female	Male
<u>Migration Plans</u>			
Mild food insecurity	-0.081 (0.065)	-0.114* (0.068)	-0.073 (0.106)
Moderate food insecurity	-0.113 (0.122)	-0.195 (0.128)	-0.087 (0.199)
Severe food insecurity	-0.015 (0.165)	-0.155 (0.177)	0.042 (0.262)
Female	-0.067 (0.053)		
Rural area	-0.002 (0.055)	0.050 (0.049)	-0.041 (0.103)
Large City	0.104** (0.043)	0.060 (0.060)	0.113** (0.051)
Age	0.013*** (0.005)	0.007 (0.006)	0.020*** (0.007)
Age squared	-0.000* (0.000)	-0.000 (0.000)	-0.000* (0.000)
Number of adults	0.012** (0.005)	0.002 (0.005)	0.019** (0.007)
Number of children	0.011** (0.005)	0.010* (0.005)	0.011 (0.007)
Married or Domestic partner	0.024 (0.058)	0.065 (0.059)	-0.004 (0.097)
Separated Widowed or Divorced	0.119*** (0.034)	0.076** (0.037)	0.187*** (0.057)
Secondary education	-0.115** (0.047)	-0.162*** (0.047)	-0.087 (0.070)
Post-secondary education	-0.071 (0.072)	-0.155** (0.078)	-0.022 (0.100)
Employed full time for self	0.076** (0.030)	0.043 (0.037)	0.101** (0.043)
Employed part time	0.106* (0.057)	0.055 (0.061)	0.138 (0.089)
Unemployed	0.080 (0.056)	0.007 (0.050)	0.136 (0.100)
Out of workforce	0.052** (0.024)	0.078** (0.031)	0.031 (0.038)
Household Income-Second 20%	0.002 (0.028)	0.012 (0.032)	-0.015 (0.042)
Household Income-Middle 20%	-0.028 (0.028)	-0.017 (0.031)	-0.039 (0.042)
Household Income-Fourth 20%	0.049* (0.028)	0.061* (0.036)	0.024 (0.040)
Household Income-Richest 20%	0.060** (0.029)	0.081* (0.042)	0.022 (0.041)
Social networks	-0.005 (0.061)	0.084 (0.057)	-0.072 (0.102)
Help outside	0.231 (0.152)	0.054 (0.184)	0.311 (0.212)

Variables	Total sample	Female	Male
Access to internet	-0.032 (0.042)	-0.048 (0.051)	-0.035 (0.061)
Home has television	0.018 (0.027)	-0.075** (0.032)	0.076** (0.034)
Public transportation access	-0.072*** (0.020)	-0.080** (0.033)	-0.050* (0.025)
Log GDP Per Capita (2010 US\$)	-0.123*** (0.026)	-0.094** (0.037)	-0.136*** (0.035)
National unemployment	0.012*** (0.002)	0.006** (0.002)	0.017*** (0.004)
<u>Migration Intentions</u>			
Mild food insecurity	0.248*** (0.011)	0.242*** (0.015)	0.251*** (0.016)
Moderate food insecurity	0.466*** (0.012)	0.462*** (0.016)	0.468*** (0.017)
Severe food insecurity	0.557*** (0.014)	0.560*** (0.019)	0.560*** (0.019)
Female	-0.131*** (0.009)		
Rural or farm	-0.167*** (0.010)	-0.141*** (0.014)	-0.196*** (0.014)
Large City	0.070*** (0.010)	0.091*** (0.014)	0.047*** (0.015)
Age	-0.008*** (0.002)	-0.008** (0.003)	-0.008** (0.003)
Age squared	-0.000** (0.000)	-0.000** (0.000)	-0.000* (0.000)
Married or Domestic partner	-0.201*** (0.011)	-0.189*** (0.015)	-0.205*** (0.016)
Separated Widowed or Divorced	-0.101*** (0.017)	-0.089*** (0.022)	-0.097*** (0.030)
Secondary education	0.209*** (0.010)	0.229*** (0.014)	0.177*** (0.014)
Post-secondary education	0.259*** (0.015)	0.295*** (0.022)	0.206*** (0.022)
Employed full time for self	0.008 (0.013)	-0.010 (0.021)	0.013 (0.017)
Employed part time	0.116*** (0.013)	0.091*** (0.020)	0.127*** (0.019)
Unemployed	0.116*** (0.016)	0.069*** (0.024)	0.147*** (0.022)
Out of workforce	-0.037*** (0.012)	-0.083*** (0.017)	0.016 (0.018)
Social networks	-0.194*** (0.009)	-0.197*** (0.013)	-0.188*** (0.014)
Help outside	0.367*** (0.008)	0.405*** (0.012)	0.325*** (0.012)
Access to internet	0.147***	0.155***	0.136***

Variables	Total sample	Female	Male
	(0.010)	(0.014)	(0.015)
Home has television	0.037***	0.095***	-0.012
	(0.012)	(0.017)	(0.017)
Log GDP Per Capita (2010 US\$)	-0.012**	-0.012*	-0.012*
	(0.005)	(0.007)	(0.007)
Number of observations	122,826	66,304	56,522

Notes: Data source is GWP/FAO, 2014-15. Coefficients are Log Odds. Standard errors are in parentheses. Each regression also includes controls for year.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Appendix

Appendix A: FAO Food Insecurity Experience Scale Survey Module

Table A1. FAO Food Insecurity Experience Scale Survey Module (FIES-SM)

Q1. You were worried you would run out of food because of a lack of money or other resources?	(Yes/No)
Q2. You were unable to eat healthy and nutritious food because of a lack of money or other resources?	(Yes/No)
Q3. You ate only a few kinds of foods because of a lack of money or other resources?	(Yes/No)
Q4. You had to skip a meal because there was not enough money or other resources to get food?	(Yes/No)
Q5. You ate less than you thought you should because of a lack of money or other resources?	(Yes/No)
Q6. Your household ran out of food because of a lack of money or other resources?	(Yes/No)
Q7. You were hungry but did not eat because there was not enough money or other resources for food?	(Yes/No)
Q8. You went without eating for a whole day because of a lack of money or other resources?	(Yes/No)

Note: Source FAO Voices of the Hungry. “Affirmative” responses are indicated in bold.

Appendix B: Dependent and Independent Variables Description

Table B1. Dependent and Independent Variables

Variables	Description
<u><i>Dependent Variable</i></u>	
Migration Intentions	Ideally, if you had the opportunity, would you like to move PERMANENTLY to another country, or would you prefer to continue living in this country?
Migration Decisions	Have you done any preparation for this move? For example, have you applied for residency or a visa, purchased the ticket, etc.?
Robustness Check	
Migration Plans	Are you planning to move permanently to another country in the next 12 months, or not?
<u><i>Focal Explanatory Variables</i></u>	
Food Insecurity (ordinal)	The categories of food insecurity are food secure (0), mild food insecurity (1), moderate food insecurity (2), and severe food insecurity (3), with each respondent deterministically assigned to one of the four classes.
<u><i>Demographic Variables</i></u>	
Female	<i>Female</i> is a dummy variable that equals one if the individual is female; zero otherwise.
Age	<i>Age</i> is a continuous variable from 18 to 64 years of age.
Number of Adults	<i>Number of Adults</i> is a continuous variable of the number of adults (15 years of age or older) that reside in the household.
Number of Children	<i>Number of Children</i> is a continuous variable of the number of children (14 years of age or younger) that reside in the household.
Marital Status	<i>Marital Status</i> is represented by a set of dummy variables for single or never been married; married or domestic partner; and separated, widowed, or divorced. Married is the reference category.
<u><i>Human Capital Variables</i></u>	
Education level	<i>Education Level</i> is separated into three categories by the highest level of attainment and is coded as a set of dummy variables with elementary education or less (up to eight years), three-year secondary education (nine to 15 years), and four years of education beyond “high school” or a college education. Elementary education is the reference category.
<u><i>Economic Variables</i></u>	
Employment Status	<i>Employment Status</i> is coded as a set of dummy variables with employed full time, self-employed, employed part time, unemployed, and out of the workforce. Employed full time is the reference category.
Household Income Quintiles	<i>Household Income</i> is a continuous measure of the household’s imputed income. Household income is initially reported in the individual’s local currency, and is then equated across countries by converting the local currency to international dollars using the World Bank’s PPP (2011) private consumption conversion factor. I use a quintile version of household income that allows us to control for the possible nonlinear relationship with migration behavior, giving us: The Poorest 20%; Second 20%; Middle 20%; Fourth 20%; Richest 20%.
<u><i>Social Variables</i></u>	
Social Networks	<i>Social Network</i> is a binary variable that equals one if the individual is satisfied with their ability to make friends; zero otherwise.

Help Outside *Transfers* is coded as dummy variable which represent whether the individual has relatives or friends living in another country whom they can count on in times of need; zero otherwise.

Connectivity Variables

Internet Access *Internet Access* is a binary variable that equals one if the individual's home has access to the internet; zero otherwise.

TV in Home *TV in Home* is a binary variable that equals one if the individual's home has access to a television; zero otherwise.

Public Transit Access *Public Transit Access* is a binary variable that equals one if in the city or area where the individual lives, they are satisfied with the public transportation systems; zero otherwise.

Locational and Macroeconomic Variables

Rural and Urban Status *Rural and Metro Status* represents the area in which the individual resides with a set of dummy variables for rural area or on a farm, small town or village, large city, and suburb of a large city. Large city is the reference category.

Log GDP Per Capita *Log GDP per capita* is the log of the GDP per capita measure (in constant 2010 US\$). This variable was taken from the World Bank's World Development Indicators.

Unemployment *Unemployment rate* is the country's national-level unemployment rate taken from the World Bank's World Development Indicators.

Regime Type *Regime Type* is an ordinal measure representing the type of government in that country: Autocracy, Anocracy, or Democracy. Taken from the Polity IV database.

Ethnic fragmentation *Ethnic fragmentation* is an ordinal measure representing the degree of ethnic fragmentation in that country: No overt fragmentation; Slight ethnic fragmentation; Moderate ethnic fragmentation; and Serious ethnic fragmentation. For example, Serious ethnic fragmentation means that over twenty-five percent (and up to fifty percent) of the country's territory is effectively ruled by local authority and actively separated from the central authority of the regime. Taken from the Polity IV database.

Magnitude of ethnic violence *Magnitude of ethnic violence* is a measure of the magnitude of all episode(s) of domestic ethnic violence involving that country in that year. Taken from the Major Episodes of Political Violence (MEPV) database.

Magnitude of civil violence *Magnitude of civil violence* is a measure of the magnitude of all episode(s) of domestic civil violence involving that country in that year. Taken from the Major Episodes of Political Violence (MEPV) database.

Natural disaster occurrences (count) *Occurrences* is the total number of natural disasters occurring in that country in that year. Taken from the Emergency Events Database (EM-DAT) from the Centre for Research on the Epidemiology of Disasters (CRED).

Natural disaster occurrences (% affected) *Percent affected* is the number of people affected by natural disasters in that country in that year; divided by the population. Taken from the Emergency Events Database (EM-DAT) from the Centre for Research on the Epidemiology of Disasters (CRED).

Notes: Data sources are GWP/FAO, MEPV, EM-DAT, Polity IV, and World Development Indicators, 2014-15.

Appendix C: Summary Statistics

Table C1. Means of Analysis Variables

Variables	Migration Intentions			Migration Decisions		
	Total	Stay Intentions	Migration Intentions	Total	No Migration Decisions	Migration Decisions
Food secure	0.417 (0.493)	0.440 (0.496)	0.347*** (0.476)	0.264 (0.441)	0.418 (0.493)	0.314*** (0.464)
Mild food insecurity	0.231 (0.422)	0.232 (0.422)	0.230 (0.421)	0.200 (0.400)	0.233 (0.423)	0.211** (0.408)
Moderate food insecurity	0.209 (0.406)	0.197 (0.398)	0.243*** (0.429)	0.274 (0.446)	0.179 (0.383)	0.243*** (0.429)
Severe food insecurity	0.143 (0.350)	0.130 (0.337)	0.180*** (0.384)	0.262 (0.440)	0.170 (0.376)	0.232*** (0.422)
Female	0.515 (0.500)	0.531 (0.499)	0.466*** (0.499)	0.424 (0.494)	0.403 (0.491)	0.417 (0.493)
Rural area	0.354 (0.478)	0.378 (0.485)	0.281*** (0.449)	0.238 (0.426)	0.223 (0.416)	0.233 (0.423)
Small town or suburb	0.395 (0.489)	0.389 (0.488)	0.412*** (0.492)	0.416 (0.493)	0.394 (0.489)	0.409 (0.492)
Large city	0.252 (0.434)	0.234 (0.423)	0.307*** (0.461)	0.345 (0.476)	0.383 (0.486)	0.358*** (0.479)
Age	35.65 (12.76)	36.81 (12.91)	32.13*** (11.57)	30.77 (10.92)	31.01 (10.44)	30.85* (10.76)
Number of adults	3.710 (1.939)	3.701 (1.921)	3.738 (1.994)	4.019 (2.312)	3.812 (2.199)	3.952** (2.278)
Number of children	1.775 (2.072)	1.782 (2.069)	1.754*** (2.082)	2.140 (2.377)	1.648 (1.993)	1.979*** (2.270)
Single	0.303 (0.460)	0.263 (0.440)	0.427*** (0.495)	0.472 (0.499)	0.479 (0.500)	0.475 (0.499)
Married or Domestic partner	0.619 (0.486)	0.656 (0.475)	0.505*** (0.500)	0.459 (0.498)	0.438 (0.496)	0.452 (0.498)
Separated Widowed or Divorced	0.0778 (0.268)	0.0810 (0.273)	0.0681*** (0.252)	0.0682 (0.252)	0.0832 (0.276)	0.0731 (0.260)
Elementary education	0.459 (0.498)	0.490 (0.500)	0.363*** (0.481)	0.408 (0.492)	0.250 (0.433)	0.356*** (0.479)
Secondary education	0.449 (0.497)	0.425 (0.494)	0.521*** (0.500)	0.500 (0.500)	0.555 (0.497)	0.518** (0.500)
Completed four years beyond HS	0.0923	0.0845	0.116***	0.0924	0.196	0.126***

Variables	Migration Intentions			Migration Decisions		
	Total	Stay Intentions	Migration Intentions	Total	No Migration Decisions	Migration Decisions
	(0.289)	(0.278)	(0.320)	(0.290)	(0.397)	(0.332)
Employed full time	0.219	0.216	0.229***	0.184	0.253	0.206***
	(0.413)	(0.411)	(0.420)	(0.387)	(0.435)	(0.405)
Self Employed	0.203	0.212	0.175***	0.183	0.156	0.174***
	(0.402)	(0.409)	(0.380)	(0.387)	(0.363)	(0.380)
Employed part time	0.159	0.147	0.194***	0.234	0.216	0.228
	(0.365)	(0.354)	(0.396)	(0.423)	(0.412)	(0.420)
Unemployed	0.0912	0.0862	0.107***	0.126	0.123	0.125
	(0.288)	(0.281)	(0.309)	(0.332)	(0.329)	(0.331)
Out of workforce	0.328	0.339	0.295***	0.273	0.251	0.266
	(0.470)	(0.473)	(0.456)	(0.446)	(0.434)	(0.442)
Household Income (log)	8.241	8.255	8.200***	7.930	8.515	8.122***
	(2.066)	(2.029)	(2.176)	(2.343)	(2.146)	(2.296)
Poorest 20%	0.194	0.196	0.186***	0.187	0.140	0.171***
	(0.395)	(0.397)	(0.389)	(0.390)	(0.347)	(0.377)
Second 20%	0.197	0.200	0.189***	0.185	0.170	0.180**
	(0.398)	(0.400)	(0.391)	(0.389)	(0.376)	(0.385)
Middle 20%	0.200	0.201	0.196**	0.190	0.156	0.179***
	(0.400)	(0.400)	(0.397)	(0.393)	(0.362)	(0.383)
Fourth 20%	0.202	0.200	0.207	0.220	0.223	0.221
	(0.401)	(0.400)	(0.405)	(0.415)	(0.416)	(0.415)
Richest 20%	0.208	0.203	0.222***	0.217	0.312	0.248***
	(0.406)	(0.402)	(0.415)	(0.413)	(0.463)	(0.432)
Ability to make Friends	0.756	0.771	0.709***	0.673	0.689	0.678
	(0.430)	(0.420)	(0.454)	(0.469)	(0.463)	(0.467)
People Outside Country to Rely On	0.396	0.354	0.522***	0.604	0.803	0.669***
	(0.489)	(0.478)	(0.500)	(0.489)	(0.398)	(0.471)
Home Has Access to Internet	0.294	0.273	0.357***	0.293	0.490	0.358***
	(0.455)	(0.446)	(0.479)	(0.455)	(0.500)	(0.479)
Home Has Television	0.745	0.739	0.765***	0.709	0.833	0.750***
	(0.436)	(0.439)	(0.424)	(0.454)	(0.373)	(0.433)
Public Transportation Systems	0.554	0.578	0.484***	0.430	0.471	0.443***
	(0.497)	(0.494)	(0.500)	(0.495)	(0.499)	(0.497)
Log GDP Per Capita (2010 US\$)	7.721	7.711	7.752	7.517	7.796	7.608***
	(0.971)	(0.970)	(0.975)	(0.988)	(0.958)	(0.987)
National unemployment	8.200	7.854	9.255***	9.463	9.971	9.629***
	(6.306)	(6.160)	(6.621)	(6.450)	(6.471)	(6.461)

Variables	Migration Intentions			Migration Decisions		
	Total	Stay Intentions	Migration Intentions	Total	No Migration Decisions	Migration Decisions
Autocracy	0.0584 (0.235)	0.0658 (0.248)	0.0359** (0.186)	0.00679 (0.0821)	0.0210 (0.144)	0.0115*** (0.106)
Anocracy	0.489 (0.500)	0.490 (0.500)	0.485*** (0.500)	0.564 (0.496)	0.490 (0.500)	0.540*** (0.498)
Democracy	0.453 (0.498)	0.444 (0.497)	0.479*** (0.500)	0.429 (0.495)	0.489 (0.500)	0.449*** (0.497)
No overt fragmentation	0.884 (0.320)	0.888 (0.316)	0.872*** (0.334)	0.924 (0.265)	0.863 (0.344)	0.904*** (0.295)
Slight fragmentation	0.0356 (0.185)	0.0338 (0.181)	0.0410*** (0.198)	0.0314 (0.174)	0.0458 (0.209)	0.0361 (0.187)
Serious fragmentation	0.0221 (0.147)	0.0186 (0.135)	0.0326*** (0.178)	0.0115 (0.107)	0.0256 (0.158)	0.0161*** (0.126)
Magnitude of ethnic violence	0.108 (0.509)	0.0980 (0.452)	0.139*** (0.653)	0.131 (0.695)	0.171 (0.841)	0.144** (0.746)
Magnitude of civil violence	0.215 (0.740)	0.235 (0.760)	0.153*** (0.669)	0.0951 (0.450)	0.141 (0.646)	0.110** (0.523)
Natural disaster occurrences	3.968 (4.406)	4.283 (4.757)	2.931*** (2.716)	2.639 (2.242)	2.625 (2.030)	2.634 (2.172)
Percent total affected by natural disaster	4.064 (8.016)	4.127 (8.093)	3.853*** (7.751)	3.496 (7.266)	3.565 (7.189)	3.520 (7.239)
Number of observations	124,198	93,602	30,596	5,011	3,286	1,725

Notes: Data source is GWP/FAO, 2014-15. Standard errors are in parenthesis. Sample weights provided by Gallup are used to calculate descriptive statistics and prevalence rates.

*** Category significantly different, at the 1 percent level.

** Category significantly different, at the 5 percent level.

* Category significantly different, at the 10 percent level.

Appendix D: Alternative Model and Results Specifications for Migration Decisions

Table D1. Coefficients and Standard Errors from Binary-Choice Model with Sample-Selection: Odds Ratios

Variables	Total sample	Female	Male
<u>Migration Decisions</u>			
Mild food insecurity	1.107** (0.053)	1.116 (0.082)	1.092 (0.075)
Moderate food insecurity	1.151* (0.089)	1.085 (0.152)	1.183 (0.121)
Severe food insecurity	1.344*** (0.118)	1.284* (0.182)	1.373** (0.186)
Female	0.833*** (0.030)		
Rural area	0.912* (0.049)	1.005 (0.088)	0.860** (0.053)
Large City	1.094** (0.042)	1.136** (0.071)	1.062 (0.053)
Age	1.025*** (0.009)	1.028* (0.016)	1.026** (0.012)
Age squared	1.000*** (0.000)	1.000** (0.000)	1.000*** (0.000)
Number of adults	0.995 (0.008)	1.007 (0.013)	0.988 (0.010)
Number of children	1.001 (0.009)	0.996 (0.014)	1.006 (0.008)
Married or Domestic partner	0.852*** (0.036)	0.838*** (0.047)	0.857** (0.055)
Separated Widowed or Divorced	1.033 (0.061)	0.999 (0.079)	1.094 (0.097)
Secondary education	1.229*** (0.044)	1.341*** (0.082)	1.144*** (0.053)
Post-secondary education	1.425*** (0.079)	1.607*** (0.152)	1.294*** (0.073)
Employed full time for self	1.006 (0.050)	0.992 (0.076)	1.016 (0.068)
Employed part time	1.198*** (0.057)	1.131 (0.087)	1.263*** (0.076)
Unemployed	1.155** (0.068)	1.062 (0.099)	1.227** (0.101)
Out of workforce	0.972 (0.039)	0.990 (0.063)	0.949 (0.061)
Household Income-Second 20%	0.988 (0.042)	0.904 (0.069)	1.062 (0.064)
Household Income-Middle 20%	0.973 (0.048)	0.900 (0.066)	1.031 (0.067)
Household Income-Fourth 20%	0.987 (0.043)	0.987 (0.069)	0.997 (0.059)
Household Income-Richest 20%	1.054 (0.044)	1.006 (0.057)	1.103 (0.066)

Variables	Total sample	Female	Male
Social networks	0.813*** (0.034)	0.861** (0.055)	0.777*** (0.037)
Help outside	2.082*** (0.097)	2.353*** (0.177)	1.924*** (0.098)
Access to internet	1.288*** (0.056)	1.291*** (0.075)	1.278*** (0.077)
Home has television	1.078* (0.047)	1.071 (0.069)	1.080 (0.061)
Public transportation access	1.014 (0.027)	1.011 (0.048)	1.016 (0.029)
Log GDP Per Capita (2010 US\$)	0.960 (0.036)	0.946 (0.045)	0.975 (0.042)
National unemployment	1.000 (0.004)	0.996 (0.004)	1.003 (0.004)
Constant	-2.513*** (0.292)	-2.752*** (0.404)	-2.554*** (0.344)

Migration Intentions

Mild food insecurity	1.233*** (0.040)	1.255*** (0.044)	1.211*** (0.051)
Moderate food insecurity	1.545*** (0.064)	1.566*** (0.078)	1.530*** (0.066)
Severe food insecurity	1.906*** (0.092)	1.947*** (0.104)	1.880*** (0.097)
Female	0.813*** (0.020)		
Rural or farm	0.811*** (0.035)	0.839*** (0.042)	0.786*** (0.036)
Large City	1.187*** (0.039)	1.223*** (0.050)	1.156*** (0.045)
Age	1.000 (0.005)	0.994 (0.006)	1.005 (0.007)
Age squared	1.000*** (0.000)	1.000 (0.000)	1.000*** (0.000)
Married or Domestic partner	0.799*** (0.029)	0.804*** (0.035)	0.796*** (0.031)
Separated Widowed or Divorced	0.966 (0.042)	0.946 (0.049)	1.014 (0.058)
Secondary education	1.175*** (0.046)	1.214*** (0.064)	1.134*** (0.046)
Post-secondary education	1.294*** (0.065)	1.346*** (0.084)	1.235*** (0.066)
Employed full time for self	1.068** (0.034)	1.015 (0.047)	1.096** (0.040)
Employed part time	1.268*** (0.045)	1.207*** (0.049)	1.303*** (0.057)
Unemployed	1.234*** (0.046)	1.100** (0.050)	1.328*** (0.063)
Out of workforce	1.017	0.960	1.062

Variables	Total sample	Female	Male
	(0.035)	(0.040)	(0.044)
Social networks	0.786***	0.805***	0.770***
	(0.022)	(0.031)	(0.026)
Help outside	1.832***	1.900***	1.771***
	(0.068)	(0.078)	(0.070)
Access to internet	1.146***	1.186***	1.110***
	(0.043)	(0.050)	(0.044)
Home has television	1.048	1.055	1.047
	(0.049)	(0.064)	(0.054)
Log GDP Per Capita (2010 US\$)	0.906**	0.893**	0.916**
	(0.038)	(0.043)	(0.038)
Constant	-1.055***	-1.114***	-1.161***
	(0.329)	(0.339)	(0.360)
<u>Error Components</u>			
ρ (Selection)	1.511***	1.303**	1.612*
	(0.428)	(0.516)	(0.922)
Log Likelihood	-20000.572	-9200.082	-10757.728
Number of observations	98,613	54,164	44,449

Notes: Data source is GWP/FAO, 2014-15. Coefficients are Odds Ratios. Standard errors are in parentheses. Each regression also includes controls for year.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Table D2. Coefficients and Standard Errors from HLM for the Determinants of Migration Decisions

Variables	Total sample	Female	Male
Mild food insecurity	-0.032* (0.018)	-0.038 (0.027)	-0.035 (0.025)
Moderate food insecurity	-0.093*** (0.019)	-0.124*** (0.028)	-0.080*** (0.025)
Severe food insecurity	-0.094*** (0.021)	-0.113*** (0.031)	-0.083*** (0.027)
Female	-0.019 (0.013)		
Rural area	0.020 (0.018)	0.053** (0.026)	-0.001 (0.023)
Large City	-0.014 (0.016)	-0.001 (0.023)	-0.028 (0.021)
Age	0.012*** (0.004)	0.016*** (0.006)	0.010* (0.005)
Age squared	-0.000*** (0.000)	-0.000** (0.000)	-0.000* (0.000)
Number of adults	-0.004 (0.004)	0.003 (0.006)	-0.010** (0.005)
Number of children	0.003 (0.004)	-0.001 (0.006)	0.004 (0.005)
Married or Domestic partner	0.003 (0.016)	-0.006 (0.023)	0.008 (0.023)
Separated, Widowed, or Divorced	0.024 (0.026)	0.023 (0.034)	0.035 (0.041)
Secondary education	0.030* (0.016)	0.052** (0.024)	0.016 (0.022)
Post-secondary education	0.079*** (0.024)	0.121*** (0.035)	0.052* (0.032)
Employed full time for self	-0.019 (0.021)	0.001 (0.035)	-0.034 (0.026)
Employed part time	-0.004 (0.020)	-0.007 (0.031)	0.010 (0.026)
Unemployed	-0.007 (0.023)	-0.010 (0.038)	-0.008 (0.029)
Out of workforce	-0.024 (0.019)	0.012 (0.029)	-0.063** (0.027)
Household Income-Second 20%	-0.013 (0.023)	-0.043 (0.034)	0.020 (0.032)
Household Income-Middle 20%	-0.024 (0.023)	-0.055 (0.034)	0.003 (0.031)
Household Income-Fourth 20%	-0.014 (0.022)	-0.004 (0.033)	-0.016 (0.030)
Household Income-Richest 20%	0.032 (0.023)	0.018 (0.034)	0.045 (0.031)
Social networks	-0.013 (0.014)	0.010 (0.021)	-0.034* (0.019)
Help outside	0.152*** (0.014)	0.183*** (0.021)	0.131*** (0.019)
Access to internet	0.085*** (0.016)	0.065*** (0.025)	0.101*** (0.021)

Variables	Total sample	Female	Male
Home has television	0.013 (0.019)	0.011 (0.028)	0.018 (0.025)
Public transportation	-0.001 (0.013)	-0.003 (0.020)	0.001 (0.018)
Log GDP Per Capita (2010 US\$)	0.020 (0.015)	0.019 (0.018)	0.026 (0.017)
National unemployment	-0.000 (0.002)	-0.002 (0.002)	0.001 (0.002)
Constant	-0.080 (0.133)	-0.206 (0.173)	-0.049 (0.163)
<u>Error Components</u>			
σ_i^2	0.094*** (0.011)	0.090*** (0.015)	0.091*** (0.013)
σ_{ic}^2	0.443*** (0.004)	0.434*** (0.007)	0.446*** (0.006)
Log likelihood	-3074.386	-1319.807	-1749.948
Number of Observations	5,011	2,207	2,804

Notes: Data source is GWP/FAO, 2014-15. Dependent variable is *Migration Decisions*. Coefficients are average marginal effects. Standard errors are in parentheses. Reference categories are: Single, Elementary education, Large city, and Employed full-time. Each regression also includes controls for year.

*** Significant at the 1 percent level.

** Significant at the 5 percent level.

* Significant at the 10 percent level.

Appendix E: Countries, Regions, and Food Security Status

Table E1. Descriptive Statistics by Global Regions, Countries, and Food Security Status

Regions and Countries	Migration Intentions (%)	Migration Decisions (%)	Food Secure	Mild Food Insecurity	Moderate Food Insecurity	Severe Food Insecurity
<u>East Asia, & Pacific</u>						
Cambodia	19.15	0.55	0.235	0.296	0.255	0.214
Indonesia	2.07	0.00	0.623	0.214	0.114	0.048
Malaysia	21.86	1.76	0.727	0.159	0.068	0.045
Mongolia	20.97	0.97	0.461	0.382	0.135	0.022
Myanmar	2.99	0.00	0.539	0.354	0.099	0.008
Philippines	14.41	0.76	0.272	0.265	0.285	0.179
Thailand	1.20	0.00	0.857	0.095	0.031	0.017
Vietnam	15.62	0.20	0.630	0.220	0.140	0.010
Total	12.17	0.47	0.509	0.265	0.153	0.073
<u>Europe & Central Asia</u>						
Afghanistan	25.41	0.50	0.230	0.278	0.317	0.176
Albania	62.16	3.94	0.338	0.270	0.285	0.107
Armenia	49.73	3.29	0.392	0.441	0.112	0.055
Azerbaijan	17.90	0.46	0.594	0.360	0.029	0.017
Bangladesh	20.99	0.80	0.526	0.150	0.241	0.083
Belarus	22.38	0.85	0.651	0.276	0.068	0.006
Bhutan	5.13	0.35	0.849	0.126	0.020	0.005
Bosnia Herzegovina	47.49	1.88	0.761	0.135	0.088	0.016
Bulgaria	21.64	1.82	0.637	0.249	0.099	0.016
Georgia	23.45	0.29	0.377	0.311	0.246	0.066
India	5.97	0.13	0.591	0.186	0.094	0.128
Kazakhstan	12.84	0.75	0.698	0.209	0.083	0.010
Kyrgyzstan	16.12	1.32	0.518	0.281	0.127	0.075
Macedonia	37.56	2.24	0.704	0.152	0.102	0.042
Moldova	32.32	3.38	0.543	0.401	0.047	0.009
Montenegro	27.68	0.76	0.694	0.189	0.102	0.015
Nepal	14.51	0.48	0.429	0.309	0.208	0.055
Pakistan	7.95	0.52	0.277	0.371	0.190	0.162
Romania	28.32	0.79	0.626	0.179	0.148	0.047
Serbia	29.31	2.19	0.705	0.204	0.070	0.020

Regions and Countries	Migration Intentions (%)	Migration Decisions (%)	Food Secure	Mild Food Insecurity	Moderate Food Insecurity	Severe Food Insecurity
Sri Lanka	15.31	0.50	0.629	0.214	0.120	0.037
Tajikistan	8.26	0.28	0.471	0.406	0.098	0.025
Turkey	22.79	0.39	0.362	0.297	0.239	0.102
Ukraine	25.17	0.95	0.534	0.346	0.110	0.010
Uzbekistan	4.52	0.19	0.661	0.198	0.113	0.027
Total	21.19	1.07	0.560	0.256	0.127	0.057
<u>Latin America & Caribbean</u>						
Belize	22.56	0.26	0.532	0.199	0.198	0.071
Bolivia	26.17	1.57	0.495	0.246	0.125	0.133
Brazil	10.64	0.00	0.710	0.153	0.093	0.045
Colombia	25.32	1.60	0.557	0.174	0.194	0.074
Costa Rica	21.86	1.30	0.581	0.234	0.156	0.030
Dominican Republic	51.73	3.89	0.266	0.190	0.406	0.138
Ecuador	16.82	0.73	0.503	0.234	0.144	0.119
El Salvador	47.98	3.03	0.354	0.258	0.315	0.074
Guatemala	28.20	1.99	0.348	0.260	0.291	0.101
Haiti	58.17	5.73	0.073	0.164	0.061	0.702
Honduras	48.83	1.87	0.187	0.229	0.426	0.158
Jamaica	43.48	4.89	0.271	0.313	0.232	0.183
Mexico	19.63	0.86	0.449	0.285	0.159	0.106
Nicaragua	27.94	2.07	0.317	0.239	0.339	0.105
Panama	13.95	0.84	0.456	0.260	0.213	0.071
Paraguay	9.39	0.34	0.508	0.180	0.267	0.045
Peru	30.45	1.01	0.444	0.240	0.249	0.066
Total	28.64	1.71	0.420	0.229	0.238	0.113
<u>Middle East & North Africa</u>						
Algeria	18.81	2.75	0.758	0.160	0.064	0.018
Egypt	21.30	1.39	0.584	0.158	0.136	0.122
Iraq	31.56	4.78	0.277	0.223	0.236	0.264
Jordan	28.21	1.88	0.536	0.158	0.179	0.127
Lebanon	24.51	2.59	0.822	0.122	0.036	0.020
Morocco	15.30	0.49	0.475	0.234	0.252	0.039
Palestine	20.91	1.90	0.517	0.151	0.233	0.099
Tunisia	19.00	1.92	0.713	0.107	0.069	0.111
Yemen	21.08	2.11	0.247	0.294	0.379	0.081
Total	21.96	2.03	0.554	0.177	0.177	0.092
<u>Sub-Saharan Africa</u>						

Regions and Countries	Migration Intentions (%)	Migration Decisions (%)	Food Secure	Mild Food Insecurity	Moderate Food Insecurity	Severe Food Insecurity
Angola	24.14	0.45	0.125	0.212	0.463	0.200
Benin	31.14	1.11	0.183	0.258	0.351	0.207
Botswana	20.51	0.84	0.214	0.240	0.199	0.347
Burkina Faso	24.98	1.08	0.270	0.296	0.249	0.186
Burundi	25.18	0.83	0.077	0.095	0.414	0.414
Cameroon	29.31	1.59	0.201	0.203	0.242	0.354
Congo Brazzaville	38.53	2.44	0.125	0.237	0.167	0.471
Congo Kinshasa	54.96	4.04	0.116	0.164	0.363	0.357
Ethiopia	29.27	0.78	0.251	0.292	0.340	0.118
Gabon	32.52	1.71	0.188	0.210	0.210	0.392
Ghana	50.00	3.15	0.210	0.323	0.368	0.099
Guinea	32.58	2.14	0.095	0.157	0.329	0.419
Ivory Coast	30.64	0.77	0.193	0.237	0.439	0.132
Kenya	22.81	1.37	0.274	0.170	0.214	0.342
Madagascar	10.16	0.00	0.099	0.318	0.473	0.109
Malawi	31.26	0.91	0.071	0.056	0.229	0.643
Mali	16.23	1.09	0.469	0.315	0.182	0.034
Mauritania	24.15	2.77	0.563	0.239	0.142	0.056
Mauritius	24.16	1.69	0.833	0.062	0.066	0.038
Namibia	23.80	1.47	0.220	0.162	0.153	0.465
Niger	16.10	1.18	0.121	0.275	0.324	0.280
Nigeria	44.01	1.25	0.194	0.219	0.295	0.292
Rwanda	12.81	0.36	0.343	0.211	0.296	0.150
Senegal	31.80	2.82	0.303	0.356	0.236	0.106
South Africa	17.13	0.83	0.313	0.252	0.254	0.181
Sudan	44.46	5.24	0.403	0.203	0.210	0.185
Tanzania	18.27	0.25	0.290	0.200	0.302	0.209
Togo	37.56	2.37	0.146	0.170	0.426	0.258
Uganda	34.89	1.47	0.158	0.160	0.361	0.321
Zambia	33.06	0.83	0.094	0.214	0.342	0.351
Zimbabwe	26.03	2.20	0.213	0.216	0.165	0.407
Total	28.46	1.49	0.225	0.221	0.288	0.266
Total Sample	24.19	1.37	0.418	0.232	0.208	0.142

Notes: Data source is GWP/FAO, 2014-15. Sample weights provided by Gallup are used to calculate descriptive statistics and prevalence rates.

Table E2. Descriptive Statistics by Development Rankings, Countries, and Food Security Status

Ranking and Countries	Migration Intentions (%)	Migration Decisions (%)	Food Secure	Mild Food Insecurity	Moderate Food Insecurity	Severe Food Insecurity
<u>Low-Income Countries</u>						
Afghanistan	25.41	0.50	0.230	0.278	0.317	0.176
Benin	31.14	1.11	0.183	0.258	0.351	0.207
Burkina Faso	24.98	1.08	0.270	0.296	0.249	0.186
Burundi	25.18	0.83	0.077	0.095	0.414	0.414
Cambodia	19.15	0.55	0.235	0.296	0.255	0.214
Congo Kinshasa	54.96	4.04	0.116	0.164	0.363	0.357
Ethiopia	29.27	0.78	0.251	0.292	0.340	0.118
Guinea	32.58	2.14	0.095	0.157	0.329	0.419
Haiti	58.17	5.73	0.073	0.164	0.061	0.702
Malawi	31.26	0.91	0.071	0.056	0.229	0.643
Mali	16.23	1.09	0.469	0.315	0.182	0.034
Nepal	14.51	0.48	0.429	0.309	0.208	0.055
Niger	16.10	1.18	0.121	0.275	0.324	0.280
Rwanda	12.81	0.36	0.343	0.211	0.296	0.150
Tanzania	18.27	0.25	0.290	0.200	0.302	0.209
Togo	37.56	2.37	0.146	0.170	0.426	0.258
Uganda	34.89	1.47	0.158	0.160	0.361	0.321
Zimbabwe	26.03	2.20	0.213	0.216	0.165	0.407
Total	27.07	1.39	0.220	0.222	0.288	0.270
<u>Middle-Income Countries</u>						
Albania	62.16	3.94	0.338	0.270	0.285	0.107
Algeria	18.81	2.75	0.758	0.160	0.064	0.018
Angola	24.14	0.45	0.125	0.212	0.463	0.200
Armenia	49.73	3.29	0.392	0.441	0.112	0.055
Azerbaijan	17.90	0.46	0.594	0.360	0.029	0.017
Bangladesh	20.99	0.80	0.526	0.150	0.241	0.083
Belarus	22.38	0.85	0.651	0.276	0.068	0.006
Belize	22.56	0.26	0.532	0.199	0.198	0.071
Bhutan	5.13	0.35	0.849	0.126	0.020	0.005
Bolivia	26.17	1.57	0.495	0.246	0.125	0.133
Bosnia Herzegovina	47.49	1.88	0.761	0.135	0.088	0.016
Botswana	20.51	0.84	0.214	0.240	0.199	0.347
Brazil	10.64	0.00	0.710	0.153	0.093	0.045
Bulgaria	21.64	1.82	0.637	0.249	0.099	0.016
Cameroon	29.31	1.59	0.201	0.203	0.242	0.354

Ranking and Countries	Migration Intentions (%)	Migration Decisions (%)	Food Secure	Mild Food Insecurity	Moderate Food Insecurity	Severe Food Insecurity
Colombia	25.32	1.60	0.557	0.174	0.194	0.074
Congo Brazzaville	38.53	2.44	0.125	0.237	0.167	0.471
Costa Rica	21.86	1.30	0.581	0.234	0.156	0.030
Dominican Republic	51.73	3.89	0.266	0.190	0.406	0.138
Ecuador	16.82	0.73	0.503	0.234	0.144	0.119
Egypt	21.30	1.39	0.584	0.158	0.136	0.122
El Salvador	47.98	3.03	0.354	0.258	0.315	0.074
Gabon	32.52	1.71	0.188	0.210	0.210	0.392
Georgia	23.45	0.29	0.377	0.311	0.246	0.066
Ghana	50.00	3.15	0.210	0.323	0.368	0.099
Guatemala	28.20	1.99	0.348	0.260	0.291	0.101
Honduras	48.83	1.87	0.187	0.229	0.426	0.158
India	5.97	0.13	0.591	0.186	0.094	0.128
Indonesia	2.07	0.00	0.623	0.214	0.114	0.048
Iraq	31.56	4.78	0.277	0.223	0.236	0.264
Ivory Coast	30.64	0.77	0.193	0.237	0.439	0.132
Jamaica	43.48	4.89	0.271	0.313	0.232	0.183
Jordan	28.21	1.88	0.536	0.158	0.179	0.127
Kazakhstan	12.84	0.75	0.698	0.209	0.083	0.010
Kenya	22.81	1.37	0.274	0.170	0.214	0.342
Kyrgyzstan	16.12	1.32	0.518	0.281	0.127	0.075
Lebanon	24.51	2.59	0.822	0.122	0.036	0.020
Macedonia	37.56	2.24	0.704	0.152	0.102	0.042
Madagascar	10.16	0.00	0.099	0.318	0.473	0.109
Malaysia	21.86	1.76	0.727	0.159	0.068	0.045
Mauritania	24.15	2.77	0.563	0.239	0.142	0.056
Mauritius	24.16	1.69	0.833	0.062	0.066	0.038
Mexico	19.63	0.86	0.449	0.285	0.159	0.106
Moldova	32.32	3.38	0.543	0.401	0.047	0.009
Mongolia	20.97	0.97	0.461	0.382	0.135	0.022
Montenegro	27.68	0.76	0.694	0.189	0.102	0.015
Morocco	15.30	0.49	0.475	0.234	0.252	0.039
Myanmar	2.99	0.00	0.539	0.354	0.099	0.008
Namibia	23.80	1.47	0.220	0.162	0.153	0.465
Nicaragua	27.94	2.07	0.317	0.239	0.339	0.105
Nigeria	44.01	1.25	0.194	0.219	0.295	0.292
Pakistan	7.95	0.52	0.277	0.371	0.190	0.162

Ranking and Countries	Migration Intentions (%)	Migration Decisions (%)	Food Secure	Mild Food Insecurity	Moderate Food Insecurity	Severe Food Insecurity
Palestine	20.91	1.90	0.517	0.151	0.233	0.099
Panama	13.95	0.84	0.456	0.260	0.213	0.071
Paraguay	9.39	0.34	0.508	0.180	0.267	0.045
Peru	30.45	1.01	0.444	0.240	0.249	0.066
Philippines	14.41	0.76	0.272	0.265	0.285	0.179
Romania	28.32	0.79	0.626	0.179	0.148	0.047
Senegal	31.80	2.82	0.303	0.356	0.236	0.106
Serbia	29.31	2.19	0.705	0.204	0.070	0.020
South Africa	17.13	0.83	0.313	0.252	0.254	0.181
Sri Lanka	15.31	0.50	0.629	0.214	0.120	0.037
Sudan	44.46	5.24	0.403	0.203	0.210	0.185
Tajikistan	8.26	0.28	0.471	0.406	0.098	0.025
Thailand	1.20	0.00	0.857	0.095	0.031	0.017
Tunisia	19.00	1.92	0.713	0.107	0.069	0.111
Turkey	22.79	0.39	0.362	0.297	0.239	0.102
Ukraine	25.17	0.95	0.534	0.346	0.110	0.010
Uzbekistan	4.52	0.19	0.661	0.198	0.113	0.027
Vietnam	15.62	0.20	0.630	0.220	0.140	0.010
Yemen	21.08	2.11	0.247	0.294	0.379	0.081
Zambia	33.06	0.83	0.094	0.214	0.342	0.351
Total	23.46	1.36	0.468	0.234	0.188	0.110
Total Sample	24.19	1.37	0.418	0.232	0.208	0.142

Notes: Data source is GWP/FAO, 2014-15. Sample weights provided by Gallup are used to calculate descriptive statistics and prevalence rates.