INFER WORKING PAPER SERIES

INTERNATIONAL NETWORK FOR ECONOMIC RESEARCH

No. 6 | 2022

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Forced migration and food crises *

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July 18, 2022

Abstract

Food insecurity is a pressing global concern and little is known of its economic outreach. This paper quantifies the effects of food crises on international forced migration (FIMs) flows using a structural gravity model. We construct a novel dataset that measures to the severity, intensity, and causes of the food crises. Results suggest that even mild food crises tend to increase international forced migration. Severe food crises skew FIM toward less developed countries. Our results are consistent with the fact that food crises tighten liquidity constraints on migration, worsening as food crises intensify.

JEL classification: F22, O15, Q18
Keywords: Forced migration; Food crises; Gravity equation

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*This research was conducted as part of the Project PID2021-122133NB-I00 financed by MCIN/ AEI / 10.13039/501100011033 / FEDER, EU. Also, this study was financially supported by the Research Challenges Programme of MICINN and MINECO (Spanish Government & FEDER) (RTI2018-100899-B-I00), the Generalitat Valenciana (GV/2020/012), the Junta de Andalucía (SEJ 413) and the Hellen Kellogg Institute for International Studies (University of Notre Dame). The views expressed in this paper are those of the authors alone and do not necessarily reflect the views of the Banco de España or Eurosystem.

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1 Introduction

On May 19, 2022, the cover story of The Economist (2022) "The coming food catastrophe", described a daunting scenario where the war on Ukraine hits a global food system weakened by Covid-19, climate change, and energy shocks. That same day, the Executive Director of the UN World Food Programme declared that the Ukraine conflict "will be a declaration of war on global food security", and that "it will cause: famine, destabilization and mass migration in nations around the world." (David Beasley @WFPChief, 2022), while the the UN secretary general warned against "the spectre of a global food shortage". In less than one year, the population that cannot be sure of getting enough to eat increased from 440m, to 1.6bn, and nearly 250m are on the brink of famine (The Economist, 2022). The impact is expected to be more intense in developing countries, as food represents a higher share of household budgets. Indeed, Gro Intelligence, an agriculture and climate data firm, reports that the net effect of food prices on GDP had a higher impact on developing countries.

The link between food insecurity and forced migration seems clear to policy-makers (FAO, 2016; FAO et al., 2018; Concern Worldwide and Welthungerhilfe, 2020). However, the extant literature on forced migration has apparently overlooked the role of food crises and security on internationally forced migration flows.[1]

[1]Forced migration is a loose term that refers to people displaced by human-made or natural factors. Human-made displacement occurs when people flee their homes due to armed conflicts (e.g., civil war), persecution (religious, political, or social), and development efforts (e.g., dams). Natural displacement occurs due to natural disasters (e.g., floods, earthquakes) or climate change (e.g., deforestation, desertification). Overall, both types of drivers of forced migration have been widely considered by the previous literature (e.g. Feng et al., 2010; Hatton, 2009; Neumayer, 2005; Schmeidl, 1997; Yang, 2008).

There is broad evidence that food insecurity is at the roots of a substantial part of rural-urban flows and internal displacements in developing countries. Factors such as land scarcity, hunger, low crop yields, inability to feed the family, famines, or volatility of food prices are driving forces of internal migration flows (e.g. Corbett, 1988; O'Rourke, 1995; van der Geest, 2011; Regassa and Stoecker, 2012; FAO, 2016; Tegegne and Penker, 2016; FAO et al., 2018). However, most of these studies have focused on the links between food insecurity and migration at the micro-level and only concerning internal displacements.[2]

A coordinated international food security and migration policy agenda requires a better understanding of their link. However, little is known about the impact of food crises on forced international migration (FIM) flows due to three usual suspects: data availability, empirical models, and theoretical foundations. By stretching the literature in those three directions, this paper contributes to a better understanding of the effect of different types of food crises on FIM flows.

In a first step, we construct a novel database by processing and categorizing the reports and unstructured information provided by FAO's Global Information and Early Warning System (GIEWS). This dataset intends to measure the occurrence, severity, intensity and causes of food crises, and is available for researchers. These data allow us to measure the impact of a food crisis event, its intensity, and underly-

[2] Sadiddin et al. (2019) and Smith and Floro (2020) evaluated at the micro level the relationship between the intention and preparation to migrate and food insecurity. Also, Laborde et al. (2017) and World Food Programme (2017) explore the impact of food security on current international migration flows, but with certain empirical limitations. In both studies, migration flows are measured as the change in the migration stock using data from United Nations in 5 years intervals for the period 1990-2015. Moreover, they employ the prevalence of undernourishment (PoU) as a proxy for food insecurity, an indicator whose use has been discouraged in the study of migrations ((FAO et al., 2018)).

ing cause. Although some international organizations collect and report information on these events, data is not usually available to researchers in a friendly format[3]. Indeed, Sadiddin et al. (2019) highlight that data unavailability may be one of the factors behind the relative scarcity of studies on migrations and food crises.

In a second step, we apply the structural gravity equation to a multi-country panel dataset as in Carril-Caccia et al. (2021). This empirical setting allows us to explore interesting questions, like the consistent and country-specific estimates of the impact of food crises on forced migration, depending on the destination country's level of development. Our empirical strategy minimizes several potential biases usually present in gravity equations as highlighted by Bergstrand et al. (2015), Heid et al. (2021) and Beverelli et al. (2018). In particular, this empirical strategy reduces the: (1) omitted variable bias; (2) endogeneity between forced migration and food crises; (3) change over time of the border effect (i.e., the ratio of FM vs. IDP or Internally Displaced People). Moreover, this strategy allows obtaining estimates that are consistent with the market clearance condition of theoretical economic migration and forced migration models (Anderson, 2011; Paniagua et al., 2021).

Thirdly, the paper combines the theoretical framework from Smith and Floro (2020) on the link between food crises and migration at the micro-level and the

[3]Other widely employed indicators of food insecurity, such as the Prevalence of Undernourishment (PoU), might be more readily available over long periods. However, the use of PoU has been discouraged from exploring to link between hunger and migration (see FAO et al. 2018). That is because PoU is intended to reflect chronic hunger. Since people suffering from a chronic situation of chronic hunger tend to lack the necessary resources to afford the cost of migration, the PoU would capture a case of a significant tightening of financial conditions and liquidity constraints more similar to our indicator of severe food crises. In addition, for our paper, it would not allow us to analyse the influence of liquidity constraints on the link between food security and migrations that we can capture with our indicators of food crises.

structural gravity model proposed by Paniagua et al. (2021) for explaining international bilateral asylum seekers flows. This method allows us to shed light on how food insecurity may foster FIM flows due to migrants' aim of improving their welfare or limiting it due to liquidity constraints.

Our results suggest that food crises significantly increase FIM, by 106% relative to IDP on average. Additionally, the severity and intensity of the crises seem to play a significant role. While less severe food crises show the largest effects, they progressively decrease with the level of intensity and severity of the crises. Furthermore, we find no significant difference in the effect of mild food crises on FIM flows by the development status of the destination country. Conversely, we observe fewer FIM inflows to developed countries due to intense food crises. These results reveal two contending forces. On the one hand, food crises promote forced international migration as individuals seek to improve their food security. On the other hand, severe food crises may tighten liquidity constraints on migration. Under severe food crises, individuals may need to use their resources to cover immediate food needs, limiting their ability to migrate to other countries (Smith and Floro, 2020), particularly to afford the higher upfront costs associated with migrating to developed countries.

The rest of the paper is organized as follows. Section 2 presents the theoretical framework on the link between FM and food crises. Sections 3 and 4 respectively describe the empirical methodology and data. Section 5 discusses the results and section 6 concludes.

2 Theoretical framework

We present the theoretical framework behind the link between forced migration (FM) and food crises in the following lines. We combine the model presented by Smith and Floro (2020), that explain migration intentions and preparation at the microeconomic level with the one by Paniagua et al. (2021) that applies the gravity model to forced migration flows at a macro level. These models are also based on previous works that have attempted to explain bilateral migration through a gravity model or emphasize that migration decisions are driven by individuals' utility maximization (see, for example Beine et al. (2011), Beine et al. (2016) or Grogger and Hanson (2011)).

As in the previous literature, Smith and Floro (2020) start from the assumption that individuals will migrate abroad if they expect to achieve a higher standard of living. The authors present the following utility function for an individual born in country i of staying in country i[4]:

$$u_{ii} = f_{ii} + x_{ii} + \eta_{ii} \tag{1}$$

where f_{ii} denotes individual food security status in the origin country i, x_{ii} individuals' observable characteristics related to their own traits (e.g., education) but also to those of their origin country or household, that may affect their intention to migrate, and η_{ii} stand for random individual heterogeneity. Smith and Floro (2020) posit that there is an inverse relationship between the utility of staying in country i

[4]Smith and Floro (2020) develop a model for male and female migrants. Due to the lack of data availability for the empirical analysis, in the present work, we exclude the gender dimension.

and the level of food insecurity suffered.

The expected utility of migrating to country j is represented by:

$$E(u_{ij}) = E(f_{ij} + x_{ij} - C_{ij} + \eta_{ij}) \tag{2}$$

C_{ij} stands for both monetary and psychological costs of migrating to the country j. Assuming that when deciding whether to migrate or not, individuals compare the utility u_{ii} of staying in their current location with that of migrating to a potential destination country, an individual will have the intention to migrate if $u_{ii} < E(u_{ij})$. Smith and Floro (2020) also point to the existence of a budget restriction on migrations. That is, an individual may only have a certain amount of resources available (a_{ij}) to cover the monetary costs of migration $m(\mathit{\Gamma}_c)$, so they will only have the intention to migrate if $a_{ij} \geq m(\mathit{\Gamma}_c)$.

In this regard, the authors underline that individual's ability to cover the monetary costs of migration is prone to be negatively conditioned by its level of food insecurity since the individual needs to dedicate more resources for covering their immediate food needs, leaving less available resources to migrate (a_{ij}). That is to say, although a food crisis may propel migration intentions, because they decrease the utility of staying in the origin country (u_{ii}), a food crisis can also divert resources from migration to covering basic alimentary needs. In fact, both Smith and Floro (2020) and Sadiddin et al. (2019) show that food crises increase the likelihood of migration intention but reduce the likelihood of migration preparation (which may eventually become actual migration). In other words, even if migration implies an utility improvement ($u_{ii} < E(u_{ij})$), migration may not take place due to budget constraints ($a_{ij} < m(\mathit{\Gamma}_c)$).

This framework is consistent with a broader literature on liquidity constraints to migration. That is since migration has some upfront costs, migrants need to have access to liquidity to finance their migration process. Financial constraints have been consistently found to restrain both internal (Mendola, 2008; Chernina et al., 2014) and international (Mckenzie and Rapoport, 2007; Dustmann and Okatenko, 2014; Angelucci, 2015; Bazzi, 2017; Cai, 2020) migration. Migration costs themselves are another important limitation to undertaking the migration process. Regarding international migration, movements across borders imply higher costs -as compared to internal displacements-, that migrants from developing countries may not be able to cover. Heterogeneity in liquidity constraints and migrations costs is usually an important shaper of migration behavior. For example, Mendola (2008) found that households' with higher initial wealth, which makes liquidity constraints less likely to be binding, tend to enter in higher-return international migration. At the same time, poor households tend to engage in lower-cost but also lower return internal migration. Easing liquidity constraints using, for example, a guaranteed income (Angelucci, 2015), positive income shocks (Bazzi, 2017) or access to credit (Cai, 2020), has also been found to propel migration flows, especially among the poorest or to destinations that imply high migration costs (Angelucci, 2015; McKenzie and Rapoport, 2010; Bazzi, 2017; Cai, 2020). However, persistent income shocks could reduce migration to more developed and wealthy areas.

The above-described framework can be incorporated into a structural gravity model to address the impact of food crises on forced migrants. To this end, we build on the gravity model presented by Paniagua et al. (2021)[5], which is based on economic theory, and apply the gravity model to forced migration flows, introducing multilateral resistance terms (MRT) formally for FIM flows in the spirit of Anderson and Van Wincoop (2003) for trade and Bertoli and Fernández-Huertas Moraga (2013) for migration.

This model starts from the assumption that the aggregate FM from i to j is determined by:

$$FM_{ij} = G(u_{ij})N_i \tag{3}$$

where $G(u_{ij}) = \frac{e^{u_{ij}}}{\sum_k e^{u_{ik}}}$ being k all potential destinations. In this way, $G(u_{ij})$ stands for the proportion of individuals that seek to migrate to j, and the probability of a random FM selecting a particular destination is given by a multinomial logit form. N_i is country's i population and utility $u_{ij} = ln(\varphi_{ij}/\tau_{ij})$. From this, it can be derived that[6]:

$$FM_{ij} = \frac{FM_j N_i}{FM} \times \frac{\varphi_{ij}/\tau_{ij}}{\Omega_j L_i} \tag{4}$$

where FM_{ij} is the predicted aggregate flow of FMs from country i to country j. In the first term of the equation, FM_j is the number of FM to country j, N_i is the origin country i population, and FM stands for the world's total FMs. In a frictionless world, FM_{ij} would be equal to the first term of the equation. That is to say, the share of FMs into j would be proportional to the country's i population.

The second term stands for the factors that foster or limit FM. φ_{ij} represent the potential benefits associated to migrating internationally. These benefits partly

[5]Instead of considering asylum seekers we change the notation to FM.
[6]See Paniagua et al. (2021) for a in detail description on the steps from equation 3 to 4.

depend on individual's food security (equations 1 and 2). As in Smith and Floro (2020), we assume that the utility gain from migrating internationally (u_{ij}) is positively related to the degree of food insecurity that the individual suffers on the origin country (f_{ii}). Thus, in order for international migration to take place, it should improve individual's food security status ($f_{ij} > f_{ii}$, $\varphi_{ij} > 0$).

The potential utility gain is also conditioned by the general cost of moving to country j, τ_{ij} ($\tau_{ij} > 1$), correspondent to C_{ij} in equation 2, and the individual idiosyncratic cost of moving abroad ϵ_{ij} ($\epsilon_{ij} > 1$, which is linked to η_{ij} from equation 2). Migration will take place if $\varphi_{ij} > \epsilon_{ij}\tau_{ij}$. Thus, from equation 3 it can be inferred that migration from country i to j will be negatively affected by bilateral costs τ_{ij}. The more distant country j, the more resources the migrant will need to invest.

Also, FM will be conditioned by the multilateral resistance, that is to say, the relative attractiveness of country j and the relative capacity of migrating from country i (Anderson and Van Wincoop, 2003; Head and Mayer, 2014). FM will be deterred (or fostered) by the relative cost of migrating to country j (or the relative attractiveness of country j), which is represented by Ω_j. Similarly, outward FM from country i will be negatively (or positively) moderated by the relative deterrent (or push) factors of leaving country i, which is represented by L_i.

In line with the ambiguous impact of food crises on individuals' migration decisions, food crises are present in L_i in two ways. On the one hand, as migrants may seek to move abroad to improve their food security, food crises are a push factor for FIM. On the other hand, the intensity and severity of food crises can make migration more complex. It implies that potential migrants need to dedicate more resources to covering their food needs instead of covering the costs associated with migration. We can also infer that migration to countries that imply higher upfront costs will become less intense as food crises increase severity.

Since travel costs are not directly observable, after adding a time dimension (t) we represent them with:

$$ln\tau_{ij} = \lambda_{ij} + \varepsilon_{ijt} \tag{5}$$

where λ_{ij} captures time invariant drivers of bilateral migration such as distance, common language or religious affinity, and ε_{ijt} is an unobserved i.i.d friction. By substituting equation 5 in equation 4 we obtain a tractable empirical structural gravity equation:

$$lnFM_{ijt} = ln\varphi_{ij} + \lambda_{ij} + \Omega_{jt} + L_{it} + \varepsilon_{ijt} \tag{6}$$

Accordingly, forced migration from i to j is conditioned by: (1) the potential utility gain, which is negatively related to the level of food security in the origin country, (2) bilateral migration costs, that are directly related to the distance of the country, and (3) the multilateral resistance terms Ω_{jt} and L_{it}, in which L_{it} incorporates the incidence of a food crisis by the two channels described above.

3 Empirical strategy

The gravity model presented in the previous section is log-linear (equation 6), and popular in empirical studies on forced migration. For estimation, we follow Carril-Caccia et al. (2021), the first study to adopt a fully specified structural gravity equation containing multilateral resistance terms and internal migration flows to estimate the effect of country-specific variables (in their case terrorism) on asylum migration. Their specification uses the non-linear equation proposed by Santos-Silva and Tenreyro (2006), who show that using ordinary least squares results in heteroscedasticity bias with unreliable estimates. In addition, taking the logarithm of FM_{ijt} leads to excluding from the analysis all the zeros usually present on bilateral variables. To overcome these two limitations, we follow Santos-Silva and Tenreyro (2006) and Fally (2015), and use a Poisson-Pseudo Maximum Likelihood (PPML) estimator to estimate the following structural gravity model[7]:

$$FM_{ijt} = \exp(\alpha Y_{it-1} \times INT_{ij} + \gamma RTA_{ijt-1} + \gamma Migration_{ijt-5} + \beta Border_{ij} \times Year + \lambda_{ij} + \lambda_{it} + \lambda_{jt}) \times \varepsilon_{ijt} \quad (7)$$

where FM_{ijt} is the number of forced migrants. When $i = j$, FM_{ijt} takes the value of internally displaced persons (IDP) and $i \neq j$ refers to the number of forced international migrants (FIMs). Estimating a gravity model with unbiased results necessarily implies the inclusion of origin-year and host-year fixed effects (respectively λ_{it} and λ_{jt}). This set of fixed effects controls for the multilateral resistance term (MRT) and third-country effects (Anderson and Van Wincoop, 2003; Head and Mayer, 2014). As described in section 2, these vectors (Ω_{jt} and L_{it} in equation 4) represent the relative capacity (or attractiveness) of migration from country i (or migrating to country

[7]Due to the inclusion of a large number of fixed effects, we employ the high-dimensional fixed effects PPML made available by Correia et al. (2019).

j) and control for all country-specific push and pull factors of migration (e.g. violence, total remittances inflows, natural disasters or job opportunities). In addition, the model includes origin-host fixed effects (λ_{ij}), which controls for time-invariant bilateral determinants of FIMs (e.g. geographic distance or having a language in common). Incorporating these last fixed effects is important since they control for all bilateral time-invariant unobserved determinants of FIM and reduce the potential endogeneity issue between FM and bilateral trade agreements (Figueiredo et al., 2016).

Our primary variable of interest is Y_{it-1}, which represents food crises. It aims to proxy individuals' lack of food security that may push them to migrate internationally to improve their personal utility. This variable is interacted by an indicator variable that takes the value one when the flow is international (INT_{ij}). This interaction serves three different purposes.

First, the associated coefficient (α) gauges the effect of food crises on the number of FIMs relative to the number of IDPs. In terms of the theoretical model presented in section 2, if α is positive and significant, it implies that $\varphi_{ij} > \epsilon_{ij}\tau_{ij}$ and that food crises foster FIM to a larger extent than forced domestic migration. Also, it implies that overall, individuals have enough resources to migrate abroad ($a_{ij} \geq m(\mathit{\Gamma}_c)$).

Second, as demonstrated by Heid et al. (2021), the interaction of Y_{it-1} with INT_{ij} allows gauging the extent to which food crises force people to engage in international migration at the same time that we include origin-year fixed effects (λ_{it}). Without the inclusion of IDP in the dependent variable and the interaction of Y_{it-1} with INT_{ij}, due to collinearity, it is not feasible to fully control for the MRT and estimate the effect of food crises on migration at once. Fully controlling for the MRT is important, since failing to do so would result in biased results in general, and particularly regarding the effect of food crises on FIMs (Head and Mayer, 2014).

Third, the interaction diminishes the potential endogeneity issues that might be present between FIMs and food crises. We capitalize on the domestic data to create an exogenous international border dummy that we interact with the potentially endogenous variable. The interacted coefficient measures the effect of food crises on FIM relative to IDP, that is, the difference-in-differences between domestic and international migration and thus exogenous (Beverelli et al., 2018). Under the assumption that the endogeneity issue between migration and food crisis is present for international and domestic migration, Nizalova and Murtazashvili (2016) demonstrates that the interaction of a potential endogenous variable (food crisis) and a strictly exogenous variable (INT_{ij}) results to be exogenous.

RTA_{ijt-1} refers to a dummy that takes the value one whenever a country pair has signed a regional trade agreement. The signature of a trade agreement is expected to propel migration between countries as it raises awareness of new partner countries, increases economic ties and improves diplomatic relations between signatory countries. In addition, trade agreements' positive effect on international migration is amplified by including provisions related to visas and asylum, and the labor market (Figueiredo et al., 2016; Orefice, 2015). $Migration_{ijt-5}$ refers to the population from country i that five years before t or more lived in country j. This variable is included to control for the network effect that may ease FIMs from country i to j, as past migrants can help future ones by providing aid and reducing transaction costs

(Beine et al., 2011; Mckenzie and Rapoport, 2007; Hatton, 2016). RTA and migrants' networks are expected to reduce the bilateral migration costs described in the theoretical model (τ_{ij} in equation 4). A limitation of our empirical approach is that it fails to account for other bilateral time-varying factors that are relevant drivers of forced migration. For instance, we do not account for policies like the externalization of borders carried out by the European Union, United States, or Australia, policies changes or events that affect the choice of migration routes that forced migrants to use, or the potential effect that migrants' diaspora in transit countries may have on the likelihood of reaching to their final destination (Bertoli et al., 2020; Thielemann, 2004; Frelick et al., 2016; Moreno-Lax and Lemberg-Pedersen, 2019; Wissink et al., 2020).

The food crises and regional trade agreement variables are set in $t-1$ due to the nature of asylum applications, our proxy for FIM. Often, international migrants file their asylum applications in the first safe country they arrive in or once they arrive at the country they want to migrate. This implies a period from the event that pushes FIMs to leave their home country until they arrive at the country they file the asylum application. Forced displaced migrants are often obliged to go through long and treacherous routes and/or wait in camps in different transit countries (Hatton, 2017, 2020). In addition, not always asylum seekers need to file their application immediately upon arrival; for instance, in the USA, they have one year, and in Spain, they have one month. Furthermore, the literature on food security and migration has pointed out that food crises would trigger internal migrations first, with migrants only deciding to migrate internationally if the situation persists (FAO et al., 2018).

Therefore, the inclusion of food crisis in $t-1$ allows us to determine whether a food crisis eventually fosters FIM to a larger extent than domestic migration.

$Border_{ij}$ is a indicator variable that turns to 1 when $i = j$. Analogous to trade (McCallum, 1995) and FDI literature (Mayer et al., 2010), the border variable represents people's propensity (or capacity) to migrate within their country instead of engaging in international migration. This indicator variable is collinear with country pair fixed effects (λ_{ij}). As in Bergstrand et al. (2015), we include the border dummy interacted with the year variable, controlling in this way for the changes in the border effect over time. Lastly, ε_{ijt} is the error term.

Alternatively to equation 7, we estimate specifications with a different set of fixed effects. In particular, we drop $Border_{ij} \times Year$ and replace λ_{ij} with a matrix of bilateral time-invariant determinants of migration or asylum seekers (e.g. Figueiredo et al., 2016; Neumayer, 2005; Wesselbaum and Aburn, 2019), including the logarithm of geographic distance, a set of dummies that take one when a pair of countries share a border, language, legal origins, and colonial ties, and an index which measures religious affinity between country pairs. In all estimates, standard errors are clustered at the origin-destination level.

4 Data

The present analysis tackles the impact of food crises during the period 2009-2017 on FM during 2010-2018. For this purpose, our sample includes 114 origin developing countries and 136 destination countries, from which 100 are developing[8] (see table 9 in the 6 for a list of countries included in the sample). During our period of analysis, 38 countries suffered from a food crisis. Descriptive statistics of all variables are available in table 1.

Table 1: Descriptive statistics

Variable	**Mean**	**Std. Dev.**	**Min**	**Max**
Asylum applications	3,982	114,000	0	9,610,000
Food crisis	0.23	0.42	0	1
Food insecurity, lv. 1	0.04	0.19	0	1
Food insecurity, lv. 2	0.15	0.36	0	1
Food insecurity, lv. 3	0.04	0.19	0	1
Intensity Food insecurity, lv. 1	0.12	0.6	0	4
Intensity Food insecurity, lv. 2	0.49	1.21	0	4
Intensity Food insecurity, lv. 3	0.14	0.69	0	4
Economic	0.05	0.21	0	1
Political instability & violence	0.02	0.14	0	1
Weather & diseases	0.04	0.19	0	1
Economic & political	0.04	0.19	0	1
Economic & Weather	0.07	0.26	0	1
Political & weather	0.01	0.1	0	1
More than two causes	0.01	0.07	0	1
Regional Trade Agreement	0.32	0.47	0	1
Migration stock	5.69	4.01	0	20.93
Border	0.01	0.09	0	1
Log(GDPpc origin)	7.93	1.09	5.53	11.35
Log(GDPpc destination)	9.7	1.3	5.46	11.69
Log(population origin)	16.92	1.57	11.17	21.05
Log(population destination)	16.73	1.54	9.24	21.05
Distance	8.43	0.85	3.75	9.86
Contiguity	0.05	0.22	0	1
Common language	0.19	0.39	0	1
Common legal origins	0.41	0.49	0	1
Colonial ties	0.03	0.18	0	1
Religious affinity	0.18	0.27	0	0.99

Authors' own elaboration. All variables have 30583-30645 observations.

Bilateral data on FIMs are retrieved from United Nations Refugees Agency, the

[8] We follow the countries classification from United Nations Conference on Development and Trade to identify the group of developed nations.

number of FIMs proxied by the number of asylum seekers. Not all asylum seekers are refugees as defined by the Geneva Convention. Filing an asylum application is one strategy that FMs can use to remain in the host country. During the period 2010-2018, the advanced nations' recognition rate of asylum seekers as refugees ranged between 30% and 50% (Hatton, 2020)[9]. Rejections do not necessarily imply that applicants were not affected by the requisites that should enable them to become a refugee. A share of these rejections results from applications motivated by hardships not related to ones established in the Geneva Convention.

In addition, the resolution of the applications takes time, and potential refugees and other types of FIMs can live with specific *legal rights* in the country they have applied to and avoid deportation. For instance, on average, the asylum applications processing time in Italy is eighteen months, and in Spain of one to two years (AIDA, 2016). Thus, the asylum application is a common strategy followed by foreigners who arrived in a country without being considered documented migrants (through traffickers and/or forged documentation) and to remain there in the long run. An asylum application is one of the strategies used, even if the rejection of the application is the likely outcome, and later, migrants need to become undocumented and participate in the informal economy (Bloch et al., 2011).

Alternatively, using recognized refugees would only under-represent one type of FIMs, while total migrant flows would include international migration that is not forced by extreme circumstances. Therefore, we consider that the number of asylum applications is a more appropriate proxy of forced migration than bilateral migration

[9]Notice that these statistics are the acceptance rate over processed asylum applications, not over total applications made during the period

flows or recognized refugee flows. In addition, contrary to bilateral migration flows data that is reliably available only from developing to OECD countries, asylum applications data allows us to account for migrant flows between developing nations.

Data on IDPs is retrieved from the Global Internal Displacement Database. Information on geographic distance, sharing a border, common language and legal origins, colonial ties, and religious affinity is obtained from CEPII (Head et al., 2010; Mayer and Zignano, 2011). Regional trade agreements are retrieved from Mario Larch's Regional Trade Agreements Database from Egger and Larch (2008). From United Nations Population Division, we gather data on the bilateral stock of migrants in the years 2005 and 2010. Also, we approximate the domestic population by subtracting to each countries' total population the stock of inward migrants. Finally, data on the GDP per capita and countries' populations are retrieved from the World Bank's World Development Indicators.

Data on food crises

To address the impact of food crises on FIM, we constructed a database that measures the occurrence, intensity, and causes of food crises across countries homogeneously. To this end, we borrow from the information from the United Nations Food and Agricultural Organization's (FAO) GIEWS (Global Information and Early Warning System), and structure it into a dataset that could be readily used.

In employing the data from FAO, the main difficulty we encountered stemmed from the unstructured nature of the information, which required further processing and elaboration. For this purpose, we first had to scrape the information provided on the website of the GIEWS and transform it into a database that could be useful for our analysis. Since 2009, four times a year, GIEWS reports the countries in crisis and therefore require external assistance for food. We aimed to synthesize that information into a handful of valuable variables.

The first variable of interest is *Food Crisis*, a dummy that takes the value one for the years a country is included in GIEWS. In addition, within each quarterly report, countries are classified in three levels: i) exceptional shortfall in aggregate food production/supplies, ii) severe localized food insecurity, and iii) widespread lack of access. To transform it into a unique annual observation, we collapse the data into two sets of variables. First, one reflecting the number of occurrences of each type of crisis for a given year and a given country -from 0 to 4- [10]. Those variables take the names *Intensity Food Insecurity, lv.1, 2* and *3*, respectively, according to the level of the crisis. The second one is a set of indicator variables (*Food Insecurity, lv. 1, 2* and *3*) that reflect the type of crises that prevailed during the year in each country.[11]

In addition, the GIEWS reports are accompanied by a few paragraphs describing the origin and causes of the crisis. We take advantage of this information to classify the crises according to their underlying causes. For this matter, we also scraped that information. We employed a taxonomy of keywords that led to the inclusion of each crisis among each of the types (see the list of keywords and causes/origins

[10] Given that the reports are quarterly, there is a maximum of four possible occurrences within a year for each type of crisis. Note that after a new crisis is reported, countries continue to appear in situation of food crisis in subsequent quarterly reports until the crisis fades.

[11] Two of the types of crises may take place at different points within the same year.

of food security crises in Table 2[12]). Mainly, we detect four leading causes: 1) Economic, 2) Political instability & violence, 3) Weather & diseases, and 4) Migration. When a crisis is caused simultaneously by several reasons, we include them under the variable *More than two causes* or under combinations of the previous variables, such as *Economic & Political*, *Economic & Weather* and *Political & Weather*. For the present study, we exclude those country-years affected by a food crisis provoked by migration pressures since most of these pressures result from large movements of IDPs, thus generating an issue with our dependent variable when $i = j$.

Table 2: Causes of food crises & keywords

Cause	**Keywords**
Economic	Economic crisis; economic constraints; Poor market access; Low productivity; Economic downturn; Currency depreciation; Loss of Remittances; Reduced employment opportunities; Production shortfalls; Compromising the final output; Poor pastoral conditions; Cereals harvest; Crop production and livestock; High Food prices; High inflation; Price spikes; Declining purchasing power; Fuel prices; Dependant on the import; poverty; low incomes; Depletion of household assets; Falling income from pastoral production; Damage to housing; Pests; Localized crop failure; Armyworms infestation; Transportation difficulties; Disrupt distribution systems; Restricted access.
Political instability & violence	Socio-political tensions; Social unrest; Ethnic conflicts; Conflict; Insecurity; Civil strife; War.
Weather & diseases	Drought; Insufficient rainfall; Floods; cyclone; Hurricane; Dry spells; Adverse weather; Earthquake; belg and "sugum" meher; Ebola; Cholera.
Migration	Internally displaced persons; Returnees; Refugees; Population displacement.

Authors' own elaboration. This table presents the used keywords to classify the food crises into four main categories.

Table 3 illustrates the different identified causes of food crises by the level of food insecurity. Most food crises are classified as level 2 and have more than one cause.

[12] The choice of the terms to be included in the taxonomy was made after a careful and iterative inspection of the dataset. The authors reviewed all the crises to make sure they were classifying them properly, and including new terms in the taxonomy if this was not the case.

As illustrated in Figure 1, the most frequent cause of a food crisis is a combination of economic and weather (or diseases) factors, followed by food crises caused only by economic factors and only weather and disease factors. Few food crises have more than two causes.

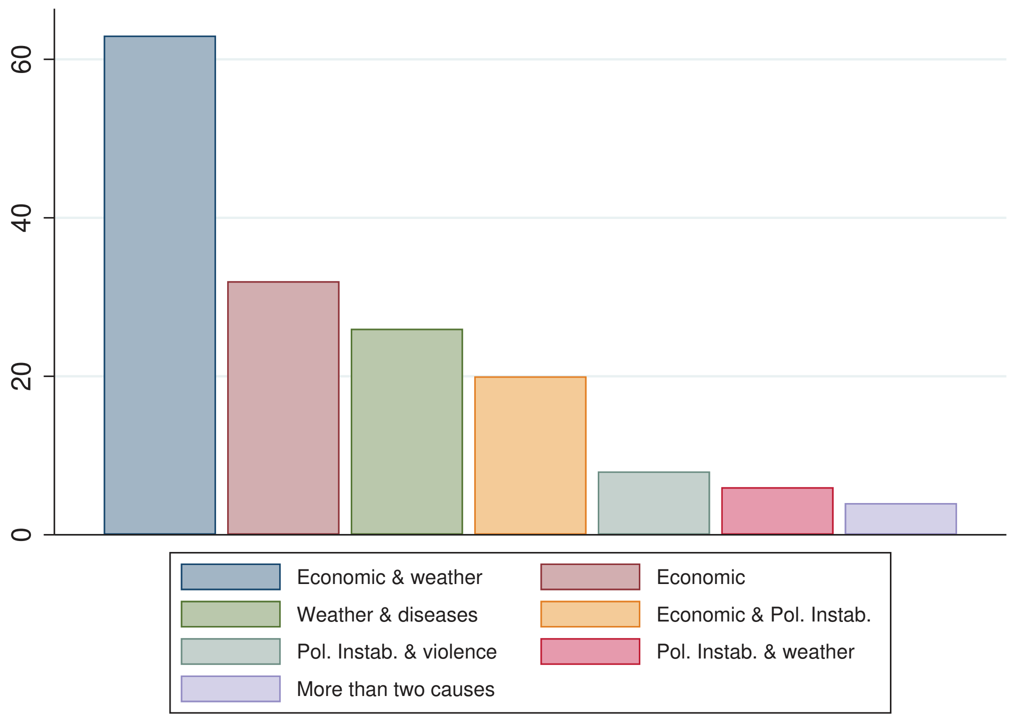

Figure 1: Causes of food crisis
Authors' own elaboration based on GEIWS database. Pol.Instab refers to political instability and violence.

Table 3: Level of food insecurity & causes

Level of food crisis	Economic	Political instability & violence	Weather & diseases	Economic & Pol. Instab.	Economic & weather	Pol. Instab. & weather	More than two causes
Level 1	10	2	0	1	15	2	0
Level 2	19	5	21	12	39	3	2
Level 3	3	1	5	7	9	1	2

Authors' own elaboration based on GEIWS database. This table illustrates the different causes of food crises (Economic, political instability & violence, migration, weather & diseases, and more than one cause) by the level of food insecurity (Level 1: exceptional shortfall in aggregate food production/supplies; Level 2: severe localized food insecurity; Level 3: widespread lack of access).

5 Results

The impact of food crises on FIMs

Column (1) in Table 4 presents the estimate of equation 7, our preferred specification. Columns (2)-(5) are different specifications of equation 7 that are less demanding in terms of inclusion of fixed effects. In columns (4) and (5) estimates do not include IDPs in the dependent variable, and are comparable to the previous literature.

Column (1) shows that a food crisis has a significant positive effect on the number of FIMs relative to the number of IDPs. This result implies that a food crisis in $t-1$ provokes growth in the number of FIMs in year t larger than in the number of IDPs. Specifically, our estimate suggests that the occurrence of a food crisis leads to a growth of FIM by 106% ((e(0.723)-1)$\times$100) relative to IDP. This estimate does not imply that the volume of FIMs is larger than that of IDPs. The specification presented in column (1), including origin-destination fixed effects, already controls the existing difference in size between domestic and international forced migration. Furthermore, the inclusion of border-year fixed effects controls for the change over time of the propensity that forced migrants to have to migrate internationally relative to domestically. In sum, column (1) estimates indicate that after controlling for the border effect and its evolution over time (McCallum, 1995; Bergstrand et al., 2015), food crises propel FIM to a larger extent than IDP.

Table 4: The effect of food crisis on FIMs

	(1)	(2)	(3)	(4)	(5)
Food crisis x INT	0.723**	0.930***	-0.766*		
	(0.293)	(0.256)	(0.442)		
Food crisis				0.039	-0.055
				(0.080)	(0.086)
Regional Trade Agreement	0.262*	0.266*	0.770***	-0.006	0.838***
	(0.157)	(0.156)	(0.168)	(0.125)	(0.172)
Migration stock	0.008	-0.026	0.256***	-0.084	0.231***
	(0.081)	(0.080)	(0.035)	(0.116)	(0.031)
Border			4.333***		
			(0.525)		
Log(GDPpc origin)				-0.247	-0.964**
				(0.158)	(0.473)
Log(GDPpc destination)					1.509**
					(0.760)
Log(population origin)				2.427**	2.240**
				(1.108)	(1.016)
Log(population destination)					-6.838**
					(2.859)
Distance			-1.075***		-0.966***
			(0.114)		(0.112)
Contiguity			0.562**		0.699***
			(0.284)		(0.212)
Common language			-0.129		0.124
			(0.190)		(0.170)
Common legal origins			-0.104		-0.138
			(0.146)		(0.141)
Colonial ties			0.676***		0.313
			(0.254)		(0.219)
Religious affinity			0.476		-0.331
			(0.415)		(0.400)
Observations	30645	30645	30645	30145	30367
Origin FE				X	X
Destination FE					X
Country pair FE	X	X		X	
Year FE					X
Origin-year FE	X	X	X		
Destination-year FE	X	X	X	X	
Border-year FE	X				
IDP	Yes	Yes	Yes	No	No

Note: Food crisis and Regional trade Agreement variables are included in $t-1$. Standard errors clustered at origin×destination level are in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Estimates indicate that signature of a Regional Trade Agreement increases the number of FIM by 30% ((e(0.262)-1)$\times$100). Migration stock turns insignificant, suggesting that the population of migrants does not help today's forced migrants by reducing transaction costs.

Estimates presented in columns (2)-(5) include fewer fixed effects and are thus subject to larger bias due to omitted variable bias and endogeneity. For the coefficient associated to food crises, not including the border-year fixed effects (column (2)) results in a larger coefficient, while also not including origin-destination fixed effects results in a coefficient that is weakly significant and negative (column (3)). Moreover, when IDPs are not included in the analysis and estimates do not fully control for the MRT (columns (4) and (5)), food crisis turns out to have a not significant effect. The chosen specification can have relevant implications on the estimated coefficients, leading to different conclusions.

Although subject to the above-highlighted biases, estimates in column (3) allow us to approximate the border effect on FM. The coefficient associated with border is positive and significant, indicating that IDPs are seventy-six (e(4.333)) times larger than the number of FIMs. The size of this border effect is substantially larger than the ones previously calculated for international trade and FDI. For example, Bailey et al. (2021) find that trade within a country is five to nine times larger than the observed international flow. In the case of FDI, Carril-Caccia et al. (2022) demonstrate that cross-border Mergers & Acquisitions are five times lower than domestic ones.

The impact of the level of food insecurity and causes of food crises on FIMs

Our previous results highlight that the impact of negative shocks on origin countries on FIMs is mixed. On the one hand, it may push forced migration due to declining living standards and security in their home country. On the other hand, the deterioration of liquidity constraints could limit migrants' ability to move abroad (Neumayer, 2005; Mayda, 2010; Angelucci, 2015; Bazzi, 2017; Missirian and Schlenker, 2017; Cai, 2020). Results reported in table 4 show that food crises propel the number of FIMs to a larger extent than IDPs, being this result aligned with the hypothesis that negative shocks push FIMs. In the present section, we tackle whether this finding depends on the level of insecurity of the food crisis or its underlying causes.

Table 5 shows the effect of food crises by their level of insecurity (column (1)) and by the intensity of that insecurity (column (2)). Table 6 illustrates the impact that food crises have on FIM relative to IDP. Food crises with the largest positive effect on FIMs are level 1 (mildest crises), while level 2 still has a positive and significant effect but is qualitatively smaller. They respectively increase FIM to a larger extent than IDP by 962% and 96%. In contrast, those food crises classified as level 3 regarding food insecurity do not significantly affect FIM differently from IDPs.

Estimates of the intensity (column (2)) are aligned with the overall findings for each level of food insecurity. An increase in the intensity of food crises with food insecurity level 1 has a larger effect on forced migration relative to IDP than an increase in the intensity of food crises with food insecurity level 2. In addition, a change in the intensity of food crises classified to be of level 3 does not seem to affect

FIM relative to IDP.

Table 5: The effect of the intensity food crisis on FIMs

	(1) Food insecurity level	(2) Intensity of food insecurity
Food insecurity, lv. 1 x INT	2.363**	
	(0.982)	
Food insecurity, lv. 2 x INT	0.673**	
	(0.295)	
Food insecurity, lv. 3 x INT	-0.001	
	(0.761)	
Intensity Food insecurity, lv. 1 x INT		0.733*
		(0.405)
Intensity Food insecurity, lv. 2 x INT		0.358***
		(0.087)
Intensity Food insecurity, lv. 3 x INT		0.101
		(0.284)
Observations	30645	30645
Country pair FE	X	X
Origin-year FE	X	X
Destination-year FE	X	X
Border-year FE	X	X
IDP	Yes	Yes

Note: Food crisis and Regional trade Agreement variables are included in $t-1$. Estimates Regional Trade Agreements and past migration as control variables. Standard errors clustered at origin×destination level are in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Results regarding the level of food crisis insecurity and intensity to a certain extent provide evidence that, as the severity and intensity of the food crisis increases, the positive effect of food crises on FIMs relative to IDPs decreases. These results are consistent with Smith and Floro (2020) and Sadiddin et al. (2019), who show that severe food crises increase individual's intention to migrate, but decrease migration preparations. These findings are also in line with the literature on the effects of financial constraints on migrations. As outlined in the theoretical framework, this

Table 6: Impact of food crises on FIM relative to IDP by level of food insecurity and intensity (%)

		Intensity change			
	Overall effect	**0 to 1**	**0 to 2**	**0 to 3**	**0 to 4**
Food insecurity, lv.1	962.3	73.3	146.6	219.9	293.2
Food insecurity, lv.2	96.0	35.8	71.6	107.4	143.2
Food insecurity, lv.3	0	0	0	0	0

Note: Authors' own calculations based on estimates reported in table 5. The overall effect for each level of food insecurity is calculated based on estimates from column (1) for the respective indicator variable associated to each level of food insecurity (e.g. food insecurity lv.1 (exp(2.363)-1)×100). Based on column (2) we approximate the effect of a change of food crisis intensity by level. As described in the data section, this variable takes values between 0 (no food crisis) to 4 (food crisis in all periods of the year). In the present table we illustrate the impact on FIM relative to IDP of a country changing from a non food crisis scenario (0) to different levels and intensities of food crisis (e.g. food insecurity lv.1 with a change from 0 to 2 is calculated by (0.733×2)×100).

is because potential migrants need to use their resources to cover urgent food needs under food crises, which may entail a tightening of financial and liquidity constraints that limit their ability to migrate. In that sense, our results suggest that when food crises are not so severe, and therefore, there are fewer financial constraints, migrants may still be able to afford the higher cost implied by cross-border (international) migrations. However, as the food crises become more severe, increasing liquidity constraints may restrict individuals' ability to migrate internationally. While Smith and Floro (2020) and Sadiddin et al. (2019) analyses are performed at the micro-level and focus on individuals' migration intention and preparation, our analysis illustrates that the intensity of a food crisis negatively impacts actual FIM at the macro level, thus confirming our proposed theoretical framework.

Results reported in table 7 provide some insight into how the different causes of food crises affect FIMs. Column (1) shows that food crises provoked only by economic or political instability & violence do not significantly affect FIMs relative to IDP. In contrast, those generated by weather & diseases reduce FIMs' number relative to the number of IDPs. However, when the food crisis has more than one cause, its

Table 7: The effect of food crises by causes on FIMs

	(1)	(2)
Economic x INT	0.307	0.357
	(0.377)	(0.386)
Political instability & violence x INT	0.546	1.200
	(0.442)	(1.056)
Weather & diseases x INT	-1.327***	-1.032**
	(0.435)	(0.451)
More than one cause x INT	1.329***	
	(0.352)	
Economic & political x INT		2.019**
		(1.019)
Economic & Weather x INT		1.101***
		(0.420)
Political & weather x INT		3.072***
		(0.517)
More than two causes x INT		-0.706
		(1.187)
Observations	30577	30577
Country pair FE	X	X
Origin-year FE	X	X
Destination-year FE	X	X
Border-year FE	X	X
IDP	Yes	Yes

Note: Food crisis and Regional trade Agreement variables are included in $t-1$. Estimates Regional Trade Agreements and past migration as control variables. Standard errors clustered at origin×destination level are in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

effect becomes positive and significant. Column (2) disentangles the impact of food crises that have two underlying causes. The ones with the largest positive effect are those that combine political instability & violence, and weather & diseases (Political & weather), followed by economic and political instability & violence (Economic & political), and then by economic and weather & diseases (Economic & weather). Food crises with more than two causes turn out to have a non-significant effect. This finding could be explained by the fact that half of food crises with more than two causes are classified as level 3 in terms of food insecurity (see table 3). Thus, statistical insignificance is aligned with the results reported in Table 5 that indicate that as the severity and intensity increase, it diminishes its effect on FIM relative to IDP.

Impact of food crises according to the level of development of the destination country

Estimates available in Table 8 tackle whether the impact of food crises differently affects the number of applications to developed nations. Overall, results show that food crises foster FIMs towards developing and developed nations in the same way, or even to a lower extent towards developed nations, depending on the intensity of the crisis.

Estimates in column (1) indicate that food crises affect FIM in developed countries as much as in developing countries. When the level and intensity of food insecurity are considered (column (2)), estimates illustrate that the impact of food crises of level 1 (mildest) is statistically equal for FIM in developing and developed countries. In contrast, in the case of level 2 and level 3, the effect of food crises is statistically lower for FIM in developed countries. The differential effect of food crises on developed countries depending on their underlying cause is addressed in column (3). Results consistently show that regardless of the underlying cause of the food crisis, the impact is significantly lower when it comes to FIM towards advanced nations. Only in the case of those food crises caused by economic and weather & diseases (Economic & weather) are found to have a larger positive effect on the number of FIMs in developed countries.

Table 8: The effect of food crises on migration towards developed and developing countries

	(1) Food crisis	(2) Food insecurity intensity	(3) Food crisis cause
Food crisis x INT	0.730**		
	(0.292)		
x Developed	-0.074		
	(0.163)		
Intensity Food insecurity, lv. 1 x INT		0.737*	
		(0.423)	
x Developed		-0.024	
		(0.108)	
Intensity Food insecurity, lv. 2 x INT		0.389***	
		(0.088)	
x Developed		-0.172***	
		(0.052)	
Intensity Food insecurity, lv. 3 x INT		0.133	
		(0.286)	
x Developed		-0.146*	
		(0.076)	
Economic x INT			0.311
			(0.392)
x Developed			-0.349
			(0.215)
Political instability & violence x INT			1.197
			(1.027)
x Developed			-0.507
			(0.319)
Weather & diseases x INT			-0.662
			(0.426)
x Developed			-0.074
			(0.172)
Economic & political x INT			2.067**
			(0.991)
x Developed			-0.633**
			(0.321)
Economic & Weather x INT			1.038**
			(0.428)
x Developed			0.415**
			(0.192)
Political & weather x INT			3.674***
			(0.594)
x Developed			-0.866**
			(0.415)
More than two causes x INT			-0.750
			(1.226)
x Developed			-1.049***
			(0.353)
Observations	30607	30645	30577
Country pair FE	X	X	X
Origin-year FE	X	X	X
Destination-year FE	X	X	X
Border-year FE	X	X	X
IDP	Yes	Yes	Yes

Note: Food crisis and Regional trade Agreement variables are included in $t-1$. Estimates Regional Trade Agreements and past migration as control variables. Standard errors clustered at origin×destination level are in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

These results also align with the predictions posited in our theoretical framework in section 2. Migrating to developed countries are likely to imply higher upfront costs of migration (the parameters τ_{ij} and C_{ij} in the theoretical framework). In addition, since severe food crises are expected to divert more resources to cover food needs, they may reduce migrants' capacity of covering those higher migration costs intrinsic to moving to a developed country (by diminishing avabilable resources to cover those costs (a_{ij})). However, when food crises are mildest, the tightening of financial conditions is expected to be lower, allowing households to overcome those higher costs.

More generally, results from tables 5, 7 8 indicate that an external shock such as a food crisis pushes FIMs, but with certain limits. The intensity of the shock and its underlying causes can significantly mitigate the positive effect of food crises on FIMs relative to IDP. In addition, food crises are found to propel FIMs within the global South particularly and have lower implications on FIMs from southern to northern countries. Those findings are also consistent with the literature on the effects of heterogeneity in liquidity constraints and migration costs, which asserts that liquidity constraint shocks affect especially in the case of poorest regions or when the destination implies high migration costs (Mayda, 2010; McKenzie and Rapoport, 2010; Angelucci, 2015; Bazzi, 2017; Cai, 2020).

6 Conclusions

The paper studies the relationship between food crises and forced migration and offers two main contributions to the literature. Firstly, a quantification of the impact, which provides a better understanding of the mechanisms by which food crises affect forced migration flows. Secondly, a database that records the occurrence, severity, intensity, and causes of food crises, which might encourage new research in this policy-relevant field of study.

Our results suggest that, on average, food crises increase the number of potential FIMs, both to developed and developing countries (by 106% relative to IDPs). The effect depends on the severity, intensity, and causes of those food crises. That is, mild food crises show the largest effects on FIMs (increasing them up to 962% relative to IDPs). However, as the severity and intensity of the food crisis increases, the positive effect of food crises on FIMs relative to IDPs decreases or even disappears. Moreover, the intensity of food crises also affects the number of asylum applicants in developed and developing countries differently. Less severe crises seem to foster FIM in developed and developing countries alike, while more extreme food crises boost the number of FIMs in other developing nations. These findings are consistent with the fact that food crises might entail a worsening of liquidity constraints on migration, which becomes more severe as the food crisis intensifies, thus limiting the capacity of the individuals to migrate in general, and particularly to countries that have higher migration costs (i.e., developed countries). In addition, we identify that crises with political instability and weather/disease origins show the largest effect on FIMs, followed by those originating from economic and political instability causes.

These results have relevant implications for public policy since they indicate that even after accounting for other determinants of forced migrations, food crises directly impact international forced migration flows. They also confirm the suspicion by the previous works that when food crises are severe, migrants must use their resources to cover immediate food needs at the expense of meeting the higher costs necessary to move abroad, particularly to a developed nation.

Within the context of the Ukraine conflict and an emerging global food crisis, improving the understanding of food crises and their consequences on migration becomes paramount to define the agenda of international organizations in the forthcoming years. Moreover, our analysis highlights the relevance of better integrating migration and food security policies, fostering coordination between international organizations tackling them.

Table 9: Sample

Only origin	Only destination	Origin and destination		Developed countries
Bhutan	Central African Rep.	Afghanistan	Kenya	Australia
Cabo Verde	Chad	Albania	Kuwait	Austria
Comoros	Dem. Rep. of Congo	Algeria	Kyrgyzstan	Belgium
Dominica	Nauru	Angola	Lebanon	Bulgaria
Equatorial Guinea	Niger	Argentina	Lesotho	Canada
Grenada	Yemen	Azerbaijan	Liberia	Croatia
Kiribati		Bahrain	Madagascar	Cyprus
Lao People's Dem. Rep.		Bangladesh	Malawi	Czech Rep.
Maldives		Belarus	Malaysia	Denmark
Myanmar		Belize	Mali	Estonia
Oman		Benin	Mauritania	Finland
Rwanda		Bolivia	Mexico	France
St. Vincent & Grenadines		Bosnia & Herzegovina	Mongolia	Germany
Samoa		Botswana	Morocco	Greece
Sao Tome & Principe		Brazil	Mozambique	Hungary
Seychelles		Burkina Faso	Namibia	Iceland
Sierra Leone		Burundi	Nepal	Ireland
Singapore		Cambodia	Nicaragua	Israel
Solomon Islands		Cameroon	Nigeria	Italy
Uzbekistan		Chile	Pakistan	Japan
Viet Nam		China	Panama	Latvia
		Hong Kong	Papua New Guinea	Lithuania
		Colombia	Paraguay	Luxembourg
		Costa Rica	Peru	Malta
		Cuba	Philippines	Netherlands
		Cote d'Ivoire	Qatar	New Zealand
		Dominican Republic	Rep. of Korea	Norway
		Ecuador	Russian Federation	Poland
		Egypt	Saudi Arabia	Portugal
		El Salvador	Senegal	Romania
		Ethiopia	South Africa	Slovakia
		Fiji	Sri Lanka	Slovenia
		Gabon	Sudan	Spain
		Gambia	Tajikistan	Sweden
		Georgia	Thailand	Switzerland
		Ghana	Togo	United Kingdom
		Guatemala	Trinidad & Tobago	United States of America
		Guinea	Tunisia	
		Guinea-Bissau	Turkey	
		Haiti	Uganda	
		Honduras	Ukraine	
		India	United Rep. of Tanzania	
		Indonesia	Uruguay	
		Iran	Venezuela	
		Iraq	Zambia	
		Jordan	Zimbabwe	
		Kazakhstan		

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