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# The decision to flee: exploring gender-specific determinants of international refugee migration

Laura Renner<sup>1</sup> · Lena Schmid<sup>1</sup> 

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## Abstract

While the determinants of refugee migration are well-studied, heterogeneities within the group of refugees have received little attention. In this paper, we use data on female and male refugee movements among African and Asian countries in the years 2002–2018 to explore gender differences in flight behavior along three dimensions: reasons for leaving, associated costs, and factors attracting individuals to specific asylum countries. Most prominently, our results show that women are more deterred than men by longer distances and flee significantly more often to neighboring countries. In addition, the number of battle-related fatalities increases male flows to neighboring countries significantly more than it increases female flows. We also find significant differences concerning the economic situation: extreme poverty has a larger impact on women whereas GDP per capita plays a more important role for male than for female flows.

**Keywords** Refugees · International migration · Distance · Conflict · Gender

**JEL Classification** F22 · O15 · J16

## 1 Introduction

March 23, 2022, marked the shameful milestone of 100 million forcibly displaced people around the globe.<sup>1</sup> This equates to more than 1% of the world's population

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<sup>1</sup> <https://www.unhcr.org/news/press/2022/5/628a389e4/unhcr-ukraine-other-conflicts-push-forcibly-displaced-total-100-million.html>.

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that is involuntarily on the move. Who are these people and why have they decided to flee? There is considerable research on the second part of the question, which asks for the determinants of flight. Conflict, violence, and political persecution are among the main drivers (Schmeidl 1997; Davenport et al. 2003; Moore and Shellman 2004; Neumayer 2005b; Moore and Shellman 2007; Iqbal 2007; Hatton 2009; Echevarria and Gardezabal 2016; Conte and Migali 2019; Dreher et al. 2019; Murat 2020). However, all these studies treat the group of refugees as homogeneous. But do old and young people really respond similarly to civil conflict in their home country? Or do displaced men and women prefer the same country of asylum? In this study, we take up a gender<sup>2</sup> perspective when analyzing what shapes the decision to flee. More specifically, we explore whether systematic gender differences in the decision to flee exist and which factors are weighted differently by male and female refugees.

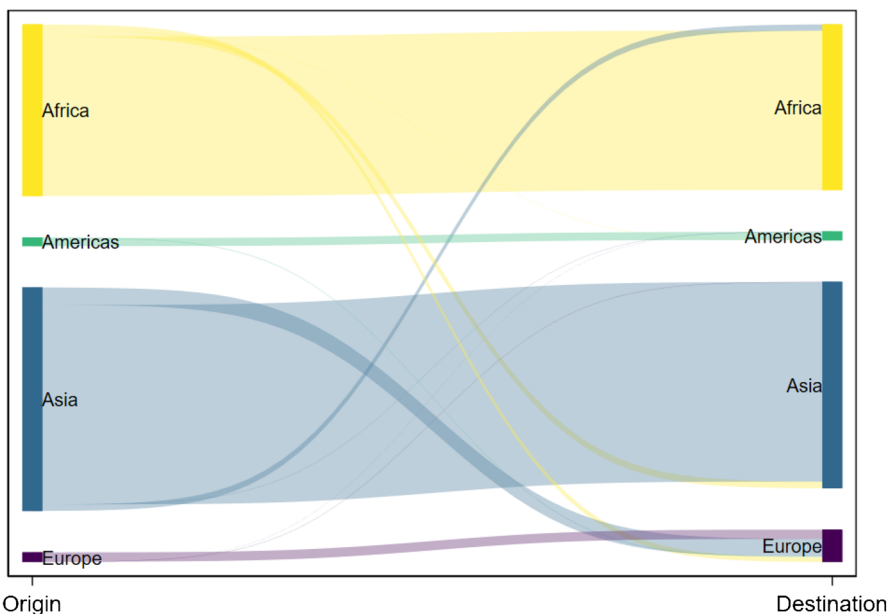
Our analysis is based on a simple model for the decision to flee, allowing for selection into fleeing and sorting into asylum countries by gender, inspired by the self-selection model for migration (see, for example, Borjas 1987; Grogger and Hanson 2011) and adaptations for refugee migration (Chin and Cortes 2015; Aksoy and Poutvaara 2021). Using this model, we derive hypotheses regarding gender differences in flight patterns along three dimensions: *push factors*, which are origin-country factors that make people leave their home country (e.g., conflict); *pull factors*, which are destination-country factors that make people choose the country of asylum (e.g., peace); and *cost factors*, which are factors specific to each country pair of home and asylum country (e.g., distance). We then test these hypotheses using data on dyadic refugee stocks by gender provided by the United Nations High Commissioner for Refugees (UNHCR) for the years 2002–2018 in Africa and Asia.

Our results are strongest for factors associated with the costs of fleeing. We find that female refugee flows decrease significantly more than male flows for higher geographic distances between origin and destination country or if they are not contiguous. This finding may be associated with greater risks along the route for women, which is supported by reports and studies showing that women face higher exposure to sexual assault and gender-based violence on their journeys (Freedman 2016a, b; Altai-Consulting 2013; MixedMigrationCentre 2018b; UNDP 2019). Further, we observe that the effects of many determinants vary between neighboring and non-neighboring country pairs. For example, conflict fatalities are a decisive factor for flight into neighboring countries. In contrast, variables of political violence are the main push factors for flight into non-neighboring countries. With respect to gender differences when fleeing to neighboring countries, low-intensity conflicts (in terms of battle-related fatalities) are associated with significantly larger male flows compared to females. Lastly, we find an interesting pattern concerning mean income and extreme poverty: The (negative) push and (positive) pull effect of GDP per capita is significantly stronger

<sup>2</sup> We use the terminology “gender”, which is a social concept and refers to cultural norms and roles of men and women, instead of “sex”, which is a physical concept based on biological attributes (Clayton and Tannenbaum 2016; Coen and Banister 2012). However, we acknowledge that both concepts are closely intertwined and can hardly be separated from each other (Stefanick and Schiebinger 2020). With the use of gender in the context of flight determinants we emphasize the importance of both physical/biological differences as well as socially constructed roles, norms, and behavior of men and women that may shape decisions differently.

for males than for females. In contrast, extreme poverty has a more substantial (positive) push and (negative) pull effect on female than on male flows, which may indicate a more severe poverty trap for women. These differences are observed between neighboring countries for the push effect and between non-neighboring countries for the pull effect.

The contribution of this paper is fourfold. First, we contribute to the empirical literature on refugee migration by offering evidence on heterogeneous flight patterns by gender. Second, our article expands on the current understanding of geographic patterns of refugee migration. We compile unique data on the geography of the route from the origin to the asylum country, allowing us to go beyond the standard measures for geographic distance. Using data from OpenStreetMap, we code a novel measure of road-based distance between two countries, arguing that this represents a more realistic proxy for refugees' real routes compared to existing measures of linear distance. Combined with geographic data on deserts, mountains, and the number of border crossings, we test three different proxies for the geographic riskiness of the journey. Further, we emphasize the role of distance by allowing flight determinants to vary by (non-)contiguity of origin and asylum country. Third, in addition to the analysis of origin-country determinants of flight, we analyze the sorting of refugees into asylum countries, a dimension that has received relatively little attention to date (see, e.g., Moore and Shellman 2007; Echevarria and Gardeazabal 2016). Fourth, by focusing on Africa and Asia, this study analyzes the world regions where most refugee flows take place. Figure 1 shows refugee flows by continent and illustrates that the majority



**Fig. 1** Total refugee flows between continents from 2002 to 2018. *Notes:* The figure depicts the sum of all refugee flows aggregated by continent from 2002 to 2018. Own calculations based on data provided by UNHCR

of refugees move within these two continents. Despite this fact, most of the studies on refugee migration include only high-income destinations, such as European, Western, or OECD countries (Hatton 2016, 2017; Aksoy and Poutvaara 2021; Barthel and Neumayer 2015; Neumayer 2004, 2005b).

The remainder of the paper is organized as follows. Section 2 reviews the literature, outlines our theoretical model for a gendered flight decision, and deducts hypotheses for our empirical analysis. In Section 3 the data is presented and the empirical estimation strategy is then laid out in Section 4. We describe and interpret the results in Section 5 and provide several robustness checks in Section 6. Lastly, in Section 7 we offer a concluding discussion.

## 2 Theoretical background

### 2.1 Migration and gender: a literature review

Refugee migrants are often described as involuntary or forced migrants. In line with, e.g., Richmond (1993) and Bates (2002), we argue that the decision to migrate occurs along a continuum of agency, i.e., the possibility to be free over migration decisions. Existing research supports this approach by emphasizing that migrants — including refugees — have the choice to stay or to leave, and when opting to leave, they have a choice of where to go (Richmond 1993; Neumayer 2005b; Melander and Öberg 2006; Davenport et al. 2003; Moore and Shellman 2006; Iqbal 2007; Krieger et al. 2020). Nevertheless, we acknowledge that the room for decision is typically much more constrained for refugees than it is for (labor or student) migrants.

In the economic literature on migration, individuals maximize utility by comparing the benefits of migrating to the costs of leaving (Sjaastad 1962). They conduct a cost-benefit calculus along three dimensions: Push factors representing characteristics of the country of origin, pull factors that are associated with the destination country and lastly, factors that illustrate the costs of migrating. The cost-benefit calculus may describe the idea of agency by adding weights and factors such as survival probabilities and life-threatening risks versus income maximization that differ between refugee and economic migration.

In addition to macro-level push, pull, and cost factors, personal characteristics matter to the evaluation of these determinants on the individual level, resulting in the so-called self-selection of migrants. The personal characteristic that is most studied is the individuals' level of education (e.g., Borjas 1987; Docquier and Marfouk 2006; Grogger and Hanson 2011; Bertoli et al. 2013). Others are risk-attitudes (Bauernschuster et al. 2014) or, most related to our study, gender (e.g., Docquier et al. 2009, 2012; Beine and Salomone 2013; Ruysen and Salomone 2018). However, studies analyzing migrant selection by gender are sparse and the results mixed. Docquier et al. (2009), for example, document increasing female emigration rates and a greater rate of high-skilled women emigrating than men for migration into few OECD countries. Their explanation of this pattern is women's desire to escape gender-based discrimination in the labor market. Other studies hint towards gender discrimination in general being a

push factor for high-skilled females (Baudassé and Bazillier 2014; Nejad and Young 2014) or from low-income countries (Gutmann et al. 2023). Ruysen and Salomone (2018) also document an increased intention to migrate for females if they perceive discrimination in their home countries, however, when making final migration preparations, more traditional factors seem to be decisive. Docquier et al. (2012) argue that (in their case, skilled) females tend to follow their spouses abroad more than vice versa. Concerning migration intentions, Friebel et al. (2018) find no gender difference for changes in migration routes from Africa to Europe, while Migali and Scipioni (2019) document higher migration intentions for men than for women in general. Others do not find differences in the effects of networks (Beine and Salomone 2013) or economic freedom in the home country (Meierrieks and Renner 2017) on the migration behavior of men and women. Considering the refugee migration literature, the majority of existing studies only look at total flows, not distinguishing refugees by gender or other individual characteristics (e.g., Schmeidl 1997; Adhikari 2012; Moore and Shellman 2004, 2006, 2007; Echevarria and Gardeazabal 2016; Davenport et al. 2003; Iqbal 2007; Neumayer 2004, 2005b; Dreher et al. 2019). Rügger and Bohnet (2018) is the first study that accounts for refugees' individual characteristics by taking into account the ethnicity of refugees for their flight decision. Most related to our study is a paper by Aksoy and Poutvaara (2021) who study the self-selection of male and female refugees and irregular migrants into Europe. They find that female and male refugees and female irregular migrants to Europe are positively self-selected in terms of their education while male irregular migrants are negatively self-selected. Accordingly, this study also looks into gender differences among refugees, however, it focuses on individual characteristics of refugees (primarily education and gender) and how they interact while we study macro-level determinants and their effect on aggregated male and female refugee flows. Therefore, our study is in so far unique as it combines the approaches of studying the drivers of flight and taking into account potential differences by gender.

## 2.2 Underlying causes for gender differences

Where could gender differences in migration patterns potentially come from? We suggest three pathways that may be responsible for a differing flight behavior between men and women: physical differences between men and women, differences in risk preferences, and the impact of cultural norms and societal roles. In this study, our focus is on analyzing *whether* and *which* gender differences in the flight decision exist. Hence, we describe these underlying causes as a theoretical foundation of our argument but refrain from a more detailed empirical analysis which would exceed the scope of this article. In the following, we discuss each of the three pathways in more detail.

The first pathway involves physical differences between men and women. Several studies document that males are stronger, faster, and more powerful compared to women (Nuzzo 2023; Hunter et al. 2023). This difference emerges with puberty and is associated with higher testosterone levels in boys leading to a larger muscle size. This physical advantage of males in terms of strength and endurance may result in

a different flight behavior between men and women, especially with respect to the migration journey. Another physical aspect is concerned with gender-based violence during migration. Freedman (2016b) as well as the UNDP (2019) report that women are the main victims of sexual violence and trafficking during migration. This additional layer of risk for female migrants may lead women to weigh the risks of flight higher than men do.

The second pathway relates to differences in preferences between men and women. The literature studies different kinds of preferences such as competitive or social preferences, but for the decision to flee risk preferences seem to be of particular interest. Although the literature is not entirely conclusive, a number of behavioral studies suggest that men and women have distinct risk preferences (see Croson and Gneezy 2009, for an overview). Most prominently it is found that women are, on average, more risk-averse than men, however, this finding often depends on context or culture (e.g., Eckel and Grossman 2008; Dohmen et al. 2011; Friedl et al. 2020; Falk and Hermle 2018; Croson and Gneezy 2009; Charness and Gneezy 2012). Nelson (2015, 2016) counters that gender differences are much less pronounced than often stated and cautions against confirmation and publication bias (an issue also addressed by Croson and Gneezy 2009). Reasons that have been discussed for such gender differences are overconfidence among males or the tendency of men to perceive risk as a challenge rather than a threat (Croson and Gneezy 2009). How may now a gender difference in risk tolerance translate into flight behavior? For conflict situations, Ceriani and Verme (2018) (for Nigeria) and Mironova et al. (2019) (for Syria) find that risk-tolerant individuals tend to stay in the conflict zone while risk-averse individuals rather decide to flee. With respect to the flight itself, different risk tolerance may lead to men taking potentially hazardous migration journeys, while women are more inclined to choose safer alternatives. Beyond the migration journey, different risk preferences may also lead to a different evaluation of other migration determinants, such as the cultural distance or the economic situation of the destination country.

The third and perhaps most important pathway considers cultural norms and societal roles that may play a critical role in shaping gender differences in migration patterns. Women are often tasked with caregiving responsibilities, such as looking after children, the elderly, or other dependents, which can limit their mobility and make migration more difficult (UNDP 2019, p. 21; Freedman 2016a, p. 574). Conversely, men are typically expected to take on the role of economic providers, which can result in pressure to migrate in search of work and financial support for their families. In many societies, men are more likely to be sent abroad by their families with the expectation that they will send remittances back home, while women are expected to stay behind and manage family responsibilities (World Bank 2017, p. 49; UNDP 2019, p. 41). Moreover, Jayachandran (2015) documents that especially in developing countries women have much lower bargaining power in family settings or freedom of choice than men which substantially constrains their decision about flight. These gendered expectations that arise from cultural norms create different constraints and opportunities for men and women, potentially shaping the migration process in distinct ways.



Overall, these pathways suggest that migration decisions are influenced not only by individual choice but also by a combination of biological, psychological, and cultural factors. Physical differences between men and women, their preferences and risk tolerance, and the societal roles they are assigned all contribute to distinct gendered migration patterns. These differences often result in varying levels of agency or in men and women weighting the factors influencing migration differently. Future research would greatly benefit from a more detailed analysis of these pathways.

### 2.3 A simple model

Most approaches to refugee migration lack a theoretical model of the decision-making process. Notable exceptions are Aksoy and Poutvaara (2021) and Chin and Cortes (2015) who develop a migration decision model for refugees based on the income-maximization framework of Borjas (1987) for (labor) migrants. For refugees, conflict or persecution enters the calculus either as a *loss* in terms of wages in the home country (Aksoy and Poutvaara 2021) or as a *disamenity* (Chin and Cortes 2015, p. 598). While Chin and Cortes (2015, p. 599) discuss self-selection related to income and skill levels, the model put forth by Aksoy and Poutvaara (2021) examines the self-selection of refugees based on skill and gender. For the first, they include a skill premium on wages. For the latter, they allow the costs of fleeing to vary by gender.

In our model, we combine the approaches by Chin and Cortes (2015), Aksoy and Poutvaara (2021), and the skill-selection model by Grogger and Hanson (2011).<sup>3</sup> We introduce gender-specific terms for each dimension: the benefits and costs of staying, the costs of fleeing, and the (dis)utility of being in a country of asylum. By including a gender-neutral term as well as a female-specific term for each factor that potentially shapes the decision to flee, we can later empirically test whether a gender difference exists and, if so, in which direction.

Individual  $i$  with gender  $g$  faces the decision of whether or not to flee from the origin country  $o$  to a country of asylum  $a$ . The utility of staying depends on the expected future income as well as the economic and political situation, and further amenities (e.g., cultural, or environmental amenities), all summarized in  $A_{io}$  (following Chin and Cortes 2015). The binary variable  $D_i^g$  equals one if the individual is female, i.e.,  $g = f$ . The female-specific term  $D_i^f A_{io}^f$  allows for gender-based differences that lead to a lower (higher) utility of staying for women, if  $A_{io}^f < (>) 0$ , compared to men. If  $A_{io}^f = 0$ , no gender differences in amenities exist, for example, when there is no gender inequality concerning wages or the use of public spaces. *Push factors* such as conflict, persecution, or oppression lead to a loss of amenities  $L_{io}$ , realized with the risk  $r_o$ . As for the amenities, the female-specific loss  $D_i^f L_{io}^f$  can either be (i) zero, if both genders face equal losses, (ii) positive if women lose more utility, e.g., in the case

<sup>3</sup> Accordingly, our model faces the same limitation as these models: It requires the decision between alternative asylum countries to be independent and to be a one-shot decision, i.e., no return or transit migration occurs. These assumptions are especially strong considering the nature of refugee movements. We will carefully address them in our empirical analysis.



of attacks on civilians, or (iii) negative if men face more severe utility losses, e.g., if they are more involved in fighting due to physical or cultural differences. Lastly, the stochastic term  $\epsilon_{i,o}$  captures unobservables associated with staying. In sum, the utility of an individual  $i$  with gender  $g$  in origin country  $o$  is described by Eq. 1:

$$U_{io}^g = A_{io} + D_i^f A_{io}^f - r_o(L_{io} + D_i^f L_{io}^f) + \epsilon_{io} \quad (1)$$

The utility to be expected in the country of asylum  $U_{iao}^g$ , shaped by *pull factors*, consists of income, economic and political factors, and amenities summarized in  $A_{ia}$  net of the *costs of fleeing* from  $o$  to  $a$ . The costs  $c_{iao}$  are a function of geographic factors such as distance between home and asylum country or relatedness in terms of language, culture, religion, or historical ties. Again, we allow for gender differences by adding female-specific costs  $D_i^f c_{iao}^f$  and pull factors  $D_i^f A_{ia}^f$ . The sign of the female-specific terms indicates again whether women are more or less strongly affected than men. Additionally, being in the country of asylum implies opportunity costs in terms of the foregone utility of staying in the home country,  $U_{io}^g$ . Further, we add a stochastic term for unobservables  $\epsilon_{ia}$  attracting individuals into a specific country of asylum. Thus, we can formulate the utility of fleeing from  $o$  to  $a$  in Eq. 2:

$$U_{iao}^g = A_{ia} + D_i^f A_{ia}^f - c_{iao} - D_i^f c_{iao}^f + \epsilon_{ia} - U_{io}^g \quad (2)$$

An individual decides to flee if, and only if, the expected utility is positive, i.e.,  $E[U_{iao}^g] > 0$ , giving us the condition for fleeing from  $o$  to  $a$ :

$$A_{ia} + D_i^f A_{ia}^f - c_{iao} - D_i^f c_{iao}^f - A_{io} - D_i^f A_{io}^f + r_o(L_{io} + D_i^f L_{io}^f) > \epsilon_{io} - \epsilon_{ia} \quad (3)$$

There will be self-selection of individuals who decide to flee depending on gender whenever Eq. 4 is satisfied. In that case, the refugee population in the country of asylum will not be random but a selected sub-population of the origin countries' residents with respect to gender.

$$D_i^f (A_{ia}^f - c_{iao}^f - A_{io}^f + r_o L_{io}^f) \neq 0 \quad (4)$$

As the direction of gender differences may vary for each term, the differences may net each other out. For example, suppose women experience higher costs of fleeing ( $c_{iao}^f > 0$ ) and higher losses resulting from conflict at home ( $L_{io}^f > 0$ ), while all else is equal for both genders (i.e.,  $A_{ia}^f = 0$ ,  $A_{io}^f = 0$ ). In this case, the fleeing population may not be selected by gender (if  $c_{iao}^f = L_{io}^f$ ). Such situations will result in a gender-balanced refugee population from the origin country in the country of asylum. Nevertheless, the analysis may reveal female-to-male differences by factor, even if they lead to no differences in the aggregate.

## 2.4 Hypotheses on gender differences across determinants of flight

Based on the theoretical model from Section 2.3 as well as existing literature on total refugee movements or economic migrants, we develop hypotheses to answer our research question: Do male and female refugees react *differently* to various determinants of flight?

**Cost factors,  $c_{iao}^f$ :** The costs of flight comprise not only monetary costs, but also physical and psychological costs including the risks of violence, torture, or slave-like treatment (UNHCR 2019; Horwood et al. 2018) or political or environmental dangers along the route (Camarena et al. 2020). All of these cost factors increase with distance and the number of borders that are crossed. Accordingly, all studies for total refugee flows find that shorter distances and/or sharing a border significantly reduce migration costs and, in turn, increase refugee movements (Moore and Shellman 2007; Iqbal 2007; Barthel and Neumayer 2015; Echevarria and Gardeazabal 2016). Contiguity may have additional effects as it may change the risk and utility assessments for other factors. Distinguishing neighboring and non-neighboring countries, Moore and Shellman (2007), for example, find that a higher GDP per capita in the country of asylum positively affects inflows into neighboring countries. Yet, for non-neighboring countries, the effect is slightly negative. Similarly, Turkoglu and Chadeaux (2019) report that flows are larger for smaller distances in combination with higher mean income and democracy in the asylum country. For this reason, we distinguish effects for neighboring from non-neighboring country pairs.

Gender differences in costs of fleeing have not been studied before, but may occur due to the aforementioned differences with respect to biology, (risk) preferences, or cultural norms. For example, females may be more likely to experience sexual and gender-based violence on their flight (Freedman 2016b; UNHCR 2019, p. 18–20; World Bank 2017, p. 84). Moreover, other characteristics of the route may be riskier for females than for males. Obstacles such as mountainous or desert terrain require more physical strength and may increase dependency on smuggling networks.<sup>4</sup> Since many female migrants perceive their smugglers as criminals (MixedMigrationCentre 2018a, p. 37) and commonly report them as perpetrators of sexual or other physical abuse (MixedMigrationCentre 2018a, p. 21; UNHCR 2019, p. 18–20; Freedman 2016b, p. 21) this dependency is particularly problematic for women.

**H1: (a)** Longer distances and **(b)** riskier routes between home and destination country increase the costs of fleeing more for women than for men, i.e.,  $c_{iao}^f > 0$ . Hence, female flows decrease more strongly than male flows and the female-to-male difference in flows is negative.

Prominent factors reducing migration costs comprise diasporas in the asylum country (Neumayer 2005b; Moore and Shellman 2007; Havinga and Böcker 1999; Adhikari

<sup>4</sup> Especially for Africa-to-Europe migration, the use of smugglers is widespread due to their knowledge about routes, geography, and navigating the terrain (Altai-Consulting 2013).

2012; Rügger and Bohnet 2018; Hatton 2016)<sup>5</sup> as well as other factors of relatedness between home and asylum country (Moore and Shellman 2007; Havinga and Böcker 1999; Rügger and Bohnet 2018; Barthel and Neumayer 2015; Krieger et al. 2018). For economic migrants, some find that females are more commonly drawn to a male diaspora, potentially driven by family reunification where wives follow their husbands (Docquier et al. 2012; Cummings et al. 2015, p. 30), while others find such a positive effect for same-gender networks (Curran and Rivero-Fuentes 2003, for Mexico-US-migration). Other case studies show that networks in general, increase female migration (Davis and Winters 2001; Heering et al. 2004; Docquier et al. 2009). Concerning relatedness, results on total flows are less clear-cut. A common language may lower the costs and increase movements (Conte and Migali 2019; Moore and Shellman 2007; Barthel and Neumayer 2015; Neumayer 2004). Yet, this relationship is not found by Echevarria and Gardeazabal (2016). Having colonial ties significantly increases flows only in some of the analyses (Havinga and Böcker 1999; Moore and Shellman 2007; Neumayer 2004), whereas in others it does not (Barthel and Neumayer 2015; Murat 2020) or only for non-neighboring countries (Moorthy and Brathwaite 2016). If women are at least to some extent more risk-averse than men (see Section 2.2), we hypothesize that women may be more interested in closer related countries and larger diasporas, as both potentially decrease information and integration costs.

**H2:** Stronger relatedness in terms of (a) cultural ties between origin and asylum country and (b) a larger diaspora in the asylum country have a stronger cost-reducing effect on women's decision to flee, i.e.  $c_{iao}^f < 0$ . Hence, female flows increase more than male flows and the female-to-male difference in flows is positive.

**Push factors,  $r_o L_{io}^f$  and  $A_{io}^f$ :** Research has consistently found that refugee flows (or stocks) increase with violence, such as war or military conflict, in the home country, and with increasing conflict intensity (Schmeidl 1997; Davenport et al. 2003; Moore and Shellman 2004; Neumayer 2005b; Moore and Shellman 2007; Iqbal 2007; Hatton 2009; Echevarria and Gardeazabal 2016; Rügger and Bohnet 2018; Conte and Migali 2019; Dreher et al. 2019; Murat 2020).<sup>6</sup> Several mechanisms suggest that men and women respond differently to conflict in their home country. First, as discussed in Section 2.1, women tend to be more risk-averse than men. Moreover, in conflict situation, risk averse individuals are found to be more likely to flee from the conflict (Mironova et al. 2019; Ceriani and Verme 2018). Hence, from a risk preference perspective, we would expect women to be more likely to flee from conflict than men. On the other hand, cultural norms and care duties within the family and society at large binds women more tightly to their home country. This lack of agency of women to freely make their flight decision is a considerable constraint to female refugee outflows. Lastly, considering

<sup>5</sup> One exception to this pattern is the study by Melander and Öberg (2006) who find a negative association between diasporas and refugee flows. They argue that with increasing refugee outflows, the population left in the origin country is increasingly unable or hesitant to leave the country.

<sup>6</sup> For related outcomes such as internally displaced persons (Davenport et al. 2003) or the recognition rate of asylum applications in Western European countries (Neumayer 2005a), results go in the same direction.

physical gender differences, men are more directly affected by conflict as they face higher propensities of being drafted for military service or of being killed in combat (Buvinic et al. 2013; Aksoy and Poutvaara 2021). The strength of these mechanisms lets us suggest that conflict has a stronger effect on males than on females.

However, with increasing conflict intensity, women and children also become more vulnerable to deteriorating public health systems and the risk of being killed in civilian attacks (Bendavid et al. 2021, p. 85; Jawad et al. 2021). Considering women's agency in high-intensity conflict situations, social networks (and their constraints on women) at home may become less relevant "[b]eyond a certain threshold of severity" (for Syrian refugees, see Schon 2019, p. 16) of the conflict. Looking at migration intentions, Smith and Floro (2020) find that women react to food insecurity only if the insecurity becomes severe enough, whereas men are already motivated by low levels of food insecurity. To conclude, we expect differential effects for conflict intensity: For low-intensity conflicts, the limited agency of women and higher vulnerability of men may result in stronger reactions of men to increases in conflict intensity. For high-intensity conflicts, differences in agency and vulnerability may lose their relevance, resulting in reduced or negligible gender differences.

**H3: (a)** For low-intensity conflicts, the utility loss of staying is higher for men than for women, i.e.,  $L_{io}^f < 0$ . Hence, female flows increase less than male flows, and the female-to-male difference is negative. **(b)** For high-intensity conflicts, the utility loss of staying is equal for men and women, i.e.,  $L_{io}^f = 0$ . Hence, female flows increase at the same rate as male flows, and the female-to-male difference is zero.

Further, conflict strategies can affect males and females differently. Sexual violence, for example, is a frequently used strategy in armed conflicts. In such environments, women are much more vulnerable as they are the prime victims of sexual assault (Koos 2017; Cohen and Nordås 2014b; Davies and True 2015). Moreover, due to the composition of fighting forces, attacks on civilians are more likely to strike women, whereas men are more likely to be wounded or killed on the battlefield. Hence, if women are heavily affected by the conflict through attacks on civilians and sexual violence, we expect to see higher outflows of female refugees compared to males.

**H4:** In conflicts where **(a)** civilians are attacked or **(b)** sexually assaulted, the utility loss of staying is higher for women than for men, i.e.,  $L_{io}^f > 0$ . Hence, female flows increase more, and the female-to-male difference is positive.

A different treatment of men and women in society — usually to the disadvantage of females — can shape migration decisions differently. The effect of gender inequality in the home country on refugee migration, however, could work in two directions: On the one hand, discrimination of women could make them want to leave their country. This relationship has been proposed for voluntary migration by Ruysen and Salomone (2018) and Baudassé and Bazillier (2014); however, it could not be established empirically. Nevertheless, the rise of the Taliban in 2021 is a prominent

example of worsening gender inequality forcing women and girls to flee (UNHCR 2021, p. 81). On the other hand, limiting women's possibilities within society may as well pose an obstacle for women's self-determined flight and thus gender inequality may even reduce female flight (as Gutmann et al. 2023 suggest for migration from low-income countries). As evidence is scarce for both options and they may even offset each other, we refrain from formulating a hypothesis.

For political and economic factors, the deduction of hypotheses on gender differences is similarly problematic for two reasons. First, the literature shows inconsistent patterns. In some studies, civil liberties (Murat 2020; Echevarria and Gardeazabal 2016; Hatton 2016, 2017), human rights (Dreher et al. 2019; Conte and Migali 2019; Neumayer 2005b), democracy or regime transition (Moore and Shellman 2007; Melander and Öberg 2006) are relevant. However, most of the significant findings stem from a set of high-income asylum countries (Neumayer 2005b; Hatton 2016, 2017; Conte and Migali 2019), which are not included in our study. Second, potential gender differences along the lines of physical differences, risk preferences, and cultural norms are not straightforward for political and economic determinants from a theoretical perspective. Accordingly, we choose not to derive hypotheses here.

**Pull factors,  $A_{ia}^f$ :** While there is much agreement on push and cost factors, there is less consensus on which factors influence the sorting of refugees into asylum countries. Nevertheless, some factors may be parallel to the push dimension. As refugees flee from violence, security issues should be a major concern. For instance, Iqbal (2007) as well as Moore and Shellman (2007) find that war in the destination country decreases refugee inflows. To the extent that women are more risk-averse and value security more than men, we hypothesize that less political violence and more peace in the destination may have greater positive pull effects on female than on male refugees. Further, gender discrimination in the destination country has been argued to play a role for voluntary migration decisions (Nejad and Young 2014; Docquier et al. 2012). Thus, in terms of gender equality, we hypothesize that there may be a significantly greater pull effect for women compared to men.

**H5: (a) Peace, (b) less political violence, and (c) gender equality in the destination country increase the utility of leaving more for women than for men, i.e.,  $A_{ia}^f > 0$ . Hence, female flows increase more, and the female-to-male difference is positive.**

Other potential pull factors are the political and economic situation in the country of asylum. Therefore, in most of the very few studies on the sorting of refugees, factors like civil liberties (Echevarria and Gardeazabal 2016; Hatton 2017) or democracy (Moore and Shellman 2007) as well as GDP per capita (Moore and Shellman 2007; Echevarria and Gardeazabal 2016; Hatton 2016, 2017; Rügger 2019) are included. However, the same caveats apply as in the push dimension: findings are inconsistent, again focusing on high-income asylum countries, and gender differences are less obvious. Thus, we remain agnostic a priori and leave the prevalence and direction of gender differences to the data.

### 3 Data

#### 3.1 Dependent variable: demographic data on refugee flows

We use publicly available data from the UNHCR, containing stocks of refugees by gender from a given origin country living in a country of asylum every December for the period 2002–2018 (UNHCR 2022). To our knowledge, no other study has used this more recent demographic data to date which is only available from 2001. Most have used the time series data for stocks of refugees that dates back to 1951 (e.g., Moore and Shellman 2006, 2007; Moorthy and Brathwaite 2016; Echevarria and Gardeazabal 2016; Dreher et al. 2019). This comprehensive data, however, also has some caveats with respect to data collection. The UNHCR gathers the data from governments in asylum countries (mainly in industrialized countries) or by own collection or of other United Nations organisations (mainly in developing countries). Up to now, the different countries and organisations lack a common standard of definitions as well as counting methods which potentially deteriorates data quality (Angenendt et al. 2016). International standardized procedures and definitions or assigning all responsibility of refugee counting to the UNHCR would substantially improve data quality. Recently, a big effort has been made by Shaver et al. (2024) in cooperation with the UNHCR to provide more accurate data of refugee flows. This new flow dataset is, however, not available with demographic information.

**Sample restriction** We restrict our sample to the regions of Africa and Asia. We do so for two reasons: First, reporting of refugee data by gender is much sparser in European and American high-income countries (UNHCR 2007, p. 47; UNHCR 2020b). Second, as depicted in Fig. 1 in Section 1, we include the world regions where most refugee flows take place globally. Together, Africa and Asia host around 65% of the worldwide refugee population in 2019 (UNHCR 2020a, p.19).<sup>7</sup> Furthermore, we restrict our sample to all country pairs for which the data set contains at least one observation.

**Imputation** The UNHCR demographic data on refugees comprises only country pairs for which the refugee stock is positive. However, the data is not always complete. In cases where a country pair time series has a one-year gap, we use linear interpolation (as discussed by Marbach 2018). For all other missing observations per dyad, i.e., more than one in a row or if the first or the last year is missing, we do not interpolate. Instead, we follow the standard approach for those cases and impute a zero (following, e.g., Dreher et al. 2019; Rügger and Bohnet 2018; Echevarria and Gardeazabal 2016). The share of imputed observations is less than 10%.

**From stocks to flows** From the dyadic stock data, i.e., the number of refugees  $R$  of gender  $g$  (female or male) living in a country of asylum  $a$  and fleeing from their origin country  $o$ , we construct the net flow of refugees for year  $t$  by gender:

$$R_{oat}^g - R_{oat-1}^g = Flow_{oat}^g \quad (5)$$

<sup>7</sup> A list of origin and destination countries analyzed in this study can be found in the Appendix, Tables B-8 and B-9.

The changes in stocks result from calculations of newly arrived refugees minus those who left (either returning or moving on), changes in status (either naturalized or received a non-humanitarian residency permit), births, or deaths. While this procedure is far from optimal, it is the only feasible way to assess the movements of refugees and is done correspondingly by others (e.g., Dreher et al. 2011; Bertoli and Moraga 2015; Melander and Öberg 2006; Moore and Shellman 2007; Beine et al. 2011; Barthel and Neumayer 2015). Whenever the net flow turns negative, more people from the origin country  $o$  have left, died, or changed their status compared to new arrivals or refugee births in the country of asylum  $a$ . We set these flows to zero as this comes closest to the variable of interest for us, which is the inflow of refugees, in line with related literature (Dreher et al. 2019, 2011; Bertoli and Moraga 2015; Melander and Öberg 2006; Moore and Shellman 2007). As a robustness check, we drop those flows, which has a negligible effect on the results. Given that our research question is about *gender differences* in response to flight determinants, a potential under- or overestimation of real flows is not an issue of concern. Further, it is unlikely that there are systematic gender differences related to naturalization, deaths, births, or the return of refugees to their home country; this supports the use of the flow variable as described.

### 3.2 Explanatory variables

In the empirical set up, we explore gender differences along the three dimensions of the refugee calculus as described in Section 2: (i) cost factors, (ii) push factors, and (iii) pull factors.<sup>8</sup>

**Cost factors** Characteristics of the route between two countries increasing the costs and risks of flight as proposed by *H1* are measured using four different variables derived from our own coding. For all variables, the underlying assumption is that refugees are more likely to travel by foot or on roads than by taking a plane. Thus, the riskiness of the route is closely aligned with the geography of the route (see, e.g., Schmeidl 1997). First, we construct a *distance* measure (in km) that is based on the roads between two countries' centroids (data comes from Open Street Map). We argue that especially when road infrastructure is poor, this measure may substantially differ from existing measures based on linear distance<sup>9</sup> and more accurately reflects the actual flight route that refugees encounter. Nevertheless, similar as for the existing distance measures, migratory distance to large countries may potentially be exaggerated since refugees are likely to stay in the border region of the destination country and do not go as far as the centroid on average. If this is the case, it may cause the effect of distance to be overstated. Based on this route, we calculate the percentage of the route that passes

<sup>8</sup> A description of variables and data sources (Table B-1) as well as summary statistics (Tables B-2, B-3, and B-4) and cross-correlation tables (Tables B-5, B-6 and B-7) for all variables can be found in the Appendix.

<sup>9</sup> In Table A-1, column (8) and Table A-2, column (6) we also use the *population weighted distance* provided by Head and Mayer (2014). This measure weights the linear distance between the two largest cities by population agglomerations. Results do not change.



through a *desert*, the percentage that passes through *mountainous terrain* as well as the *number of borders* that need to be crossed. Data on mountains has been taken from the Global Mountain Biodiversity Assessment, and information on deserts has been gathered from Natural Earth Data and OpenStreetMaps.

Addressing the effect of networks (*H2a*), we include a variable for the *refugee diaspora* coded as the mean stock of refugees from each origin in each asylum country over the last three years. We calculate this measure separately for males and females. Additionally, we have the logged stock of *legally registered migrants* from each home country in each asylum country in the year 2000 from the Global Bilateral Migration Database by Özden et al. (2011).<sup>10</sup>

To test relatedness according to *H2b*, we add binary variables that capture common *colonial ties* and a *shared official language*, from Head et al. (2010). Moreover, we include *religious distance*, *linguistic distance*, and *genetic distance* between paired countries. All variables are taken from Spolaore and Wacziarg (2016) and are constructed to reflect different dimensions of cultural proximity between two countries. The indices range from 0 (minimum distance) to 1 (maximum distance).

**Push factors** Using the UCDP Georeferenced Event Dataset (Sundberg and Melander 2013; Högladh 2021), we construct the number of fatalities as our main conflict measures.<sup>11</sup> We aggregate conflict events to country-year level and construct a count variable for the number of battle-related fatalities and divide it by 1000 to capture conflict intensity, which is used to test *H3a* and *b*. For *H4a*, we include civilian fatalities in the same manner. *H4b* is tested by including sexual violence during conflict, i.e., whether one of the conflict parties is reported to actively use sexual violence in a way that relates to the conflict. This information is taken from the Sexual Violence in Armed Conflict Data Project (SVAC) 2.0 by Cohen and Nordås (2014a) and is described by Cohen and Nordås (2014b).

We include two different variables for women's rights and the situation concerning gender inequality in the analysis: *freedom of domestic movement for women* from the Varieties of Democracy Dataset (V-Dem) described by Coppedge et al. (2021), which is used to capture whether basic human rights also apply to women. The second variable included is *female labor force participation* from the World Development Indicators, which aims at measuring equal participation and representation of men and women in

<sup>10</sup> Despite the importance of networks in the flight decision, both diaspora variables are an issue of concern due to their endogeneity. As, for example, Beine et al. (2011) discuss, there may be unobserved third factors that have an effect on the size of the diaspora and on refugee flows at the same time. Since this may bias the results, we compare the results with and without the inclusion of the diaspora variables (see Tables A-1 and A-2) and resort to the specification without diaspora measures as our preferred specification.

<sup>11</sup> In the literature, a variety of measures are used, which lead to comparable findings: Genocide and politicide (Schmeidl 1997; Davenport et al. 2003; Neumayer 2005b; Moore and Shellman 2007), civil wars (Schmeidl 1997; Davenport et al. 2003; Moore and Shellman 2004), interstate wars (Schmeidl 1997; Moore and Shellman 2007; Iqbal 2007; Hatton 2009), armed conflict (Iqbal 2007; Echevarria and Gardeazabal 2016; Dreher et al. 2019), the number of battle deaths (Hatton 2009; Rüegger and Bohnet 2018; Conte and Migali 2019), political terror (Moore and Shellman 2004; Hatton 2009, 2016; Conte and Migali 2019; Murat 2020), or the area affected by combats (Conte and Migali 2019).

society. Political oppression is captured by *freedom from political killings* and *freedom of religion*, also both from the V-Dem Dataset. To account for socio-economic and political country characteristics, we include the *polity score* measuring the level of democracy (Marshall and Gurr 2018) ranging from -10 (full autocracy) to +10 (full democracy). A dummy variable for *political instability* is coded 1 when a home country experienced a change in the polity score of three or more points within three years and zero otherwise (following Fearon and Laitin 2003). Furthermore, *GDP per capita* (from the World Development Indicators) and *population size* (from Head et al. 2010), which we include as a control variable, are used in logs. Additionally, as a proxy for poverty constraints, we add *child mortality* (under five years old, deaths per 1,000 births) from the World Development Indicators.

In an extension, we take a closer look at conflict dynamics by including a variable for *long and intense conflict* (longer than 5 years and on average more than 25 fatalities per year), for *conflict duration* (consecutive years of conflict in the origin country) as well as dummy variables for the first, second or third year of a conflict. All variables are based on the UCDP Georeferenced Event Dataset.

**Pull factors** To test *H5a*, we include variables regarding the peacefulness and security of countries, such as the number of conflict-related *fatalities* (divided by 1000) and *peace duration*, coded as the number of consecutive years of peace, both based on the UCDP Georeferenced Event Dataset. To test a potential pull effect of gender equality (*H5b*), we use the same variables as in the push dimension — *freedom of movement for women* and *female labor force participation* — but for the country of asylum. Also corresponding to the push equation, we include *freedom from political killings* and *freedom of religion*, the *polity indicator*, a dummy for *political instability*, *GDP per capita*, *population size* and *child mortality*, all as described above. Lastly, we add a variable for *male and female refugee diaspora*, as described in the cost factors section.<sup>12</sup>

## 4 Estimation strategy

The analysis of refugee movements brings about several empirical challenges due to the multifaceted nature of the decision to flee. It is very unlikely that there is only one single cause for flight. Many factors play a role, some of them impossible to observe or measure. To account for these observable as well as unobservable factors, we include different sets of fixed effects in our estimations. These fixed effects allow us to focus on the variables of one particular dimension while holding constant relevant factors of the other dimensions. We can, for example, estimate the effect of different dyad-specific variables such as distance or common language in our cost equation conditional on all origin- and destination-specific factors that vary over time, such as GDP or conflict,

<sup>12</sup> Our second measure for diaspora — legally registered migrants in 2000 — is time-invariant and therefore captured in this model by the dyad-fixed effects.

by including origin-year and destination-year fixed effects. The same logic applies to the other two dimensions.<sup>13</sup>

To test our hypotheses, we use separate regressions for each dimension relying on gravity models for the dyadic flows by gender.<sup>14</sup> The separate estimation for each dimension enables us to include different sets of fixed effects in order to exclude the influence of omitted variables, following, for example, Bertoli and Moraga (2015); Beine and Parsons (2015); Beine et al. (2019).

To answer our research question on whether gender differences (i.e., female-to-male differences) exist and which direction they take, we estimate a fully interacted model with a gender dummy ( $D^g$ ) for each factor, as shown in Eq. 3 in Section 2. To do so, we reconstruct our panel data set to a stacked data set that allows us to estimate the effect of all covariates for male refugee flows ( $D^{g=m}=0$ ) and the interaction effect, i.e., the female-to-male difference ( $D^{g=f}=1$ ).

The cost effects of flight and their impact on the gender composition of refugees are estimated in the model depicted in Eq. 6, for the flow of refugees by gender  $g$ , from origin country  $o$  to asylum country  $a$  in year  $t$ . By including origin-year fixed effects  $\gamma_{ot}$  and destination-year fixed effects  $\gamma_{at}$  in the analysis, we aim at eliminating variation in the flow variable coming from country-specific time-variant factors like GDP in the origin or destination country.

$$\begin{aligned} \text{Flow}_{oat}^g = & \beta_0 + \beta_1 \text{Distance}_{oa} + \beta_2 \text{Geography}_{oa} + \beta_3 \text{Relatedness}_{oa} \\ & + D^f \left( \beta_0^f + \beta_1^f \text{Distance}_{oa}^f + \beta_2^f \text{Geography}_{oa}^f + \beta_3^f \text{Relatedness}_{oa}^f \right) \quad (6) \\ & + \gamma_{ot} + \gamma_{at} + \epsilon_{oat} \end{aligned}$$

Equation 7 shows the estimation for gender-specific push effects on refugee migration. It comprises different forms of violence, political factors, variables of gender equality, and economic variables in the origin country as well as origin country fixed effects  $\gamma_o$ , destination-year fixed effects  $\gamma_{at}$  and country pair fixed effects  $\gamma_{oa}$ . The only remaining variation relates to time-varying origin-country characteristics. We include push factors in year  $t$ , arguing that flight is a relatively short-term decision, taking into account the situation at the moment. In an extension, we test different lag structures,  $t-1$ ,  $t-2$  and  $t-3$  (see Tables C-2 and C-4). Furthermore, our dependent variable captures the change in refugee stocks from December in  $t-1$  to December in year  $t$ , allowing for push factors to impact flows over the entire year. Theoretically, reverse causality, i.e., the outflow of refugees having an impact on conflict in their

<sup>13</sup> In addition, we run an integrated analysis where all variables are included in one model which allows an overall analysis of migration factors relative to each other. However, this prohibits the inclusion of country-year fixed effects which may result in the omission of unobservables. The results of this integrated analysis are depicted in Table C-17 in the Appendix. Additionally, a principal component analysis gives some insights in the relative importance of the three dimensions as well as of the variables. See Tables C-18–C-21 in the Appendix for the results.

<sup>14</sup> Similarly, Echevarria and Gardeazabal (2016) have applied a gravity approach on refugee migration, however, using total stocks. We stick more closely to the recent approach in migration research and analyze flows (for refugee migration, e.g., Dreher et al. 2019; Moore and Shellman 2007), which is also the original idea of the gravity model in the trade literature (Silva and Tenreyro 2006). The use of flows is also intuitive as we want to study the effect on refugee movements rather than on refugee stocks.

home country, might be an issue here. However, the vast literature that supports the conflict-flight relationship (see push factors in Section 2.4) as well as the effect of previous year's conflict on refugee outflows supports our confidence in this direction of the relationship.

$$\begin{aligned} \text{Flow}_{oat}^g = & \beta_0 + \beta_1 \text{Violence}_{ot} + \beta_2 \text{Politics}_{ot} + \beta_3 \text{Gender equality}_{ot} + \beta_4 \text{Economics}_{ot} \\ & + D^f \left( \beta_0^f + \beta_1^f \text{Violence}_{ot}^f + \beta_2^f \text{Politics}_{ot}^f + \beta_3^f \text{Gender equality}_{ot}^f + \beta_4^f \text{Economics}_{ot}^f \right) \quad (7) \\ & + \gamma_o + \gamma_{at} + \gamma_{oa} + \epsilon_{oat} \end{aligned}$$

Lastly, Eq. 8 depicts how pull variables influence the gender composition of refugee flows. To control for potential unobservables, we include asylum fixed effects  $\gamma_a$ , origin-year fixed effects  $\gamma_{ot}$ , as well as dyad fixed effects  $\gamma_{oa}$ . Independent variables are time-varying destination-specific characteristics such as peace, security, the political system, gender equality, and the economic situation. Note that for this dimension, we include all variables from  $t - 1$  in order to account for information lags.

$$\begin{aligned} \text{Flow}_{oat}^g = & \beta_0 + \beta_1 \text{Security}_{at-1} + \beta_2 \text{Politics}_{at-1} + \beta_3 \text{Gender equality}_{at-1} + \beta_4 \text{Economics}_{at-1} \\ & + D^f \left( \beta_0^f + \beta_1^f \text{Security}_{at-1}^f + \beta_2^f \text{Politics}_{at-1}^f + \beta_3^f \text{Gender equality}_{at-1}^f + \beta_4^f \text{Economics}_{at-1}^f \right) \\ & + \gamma_a + \gamma_{ot} + \gamma_{oa} + \epsilon_{oat} \quad (8) \end{aligned}$$

We apply a Poisson pseudo-maximum-likelihood (PPML) estimator to explain the differential change in dyadic stocks, i.e., flows by gender.<sup>15</sup> Silva and Tenreiro (2006, 2011) show that this estimator outperforms log-linear OLS regressions and is more consistent even with a large number of zeros. Furthermore, PPML estimators are common for gravity equations in trade (see, e.g., Head and Mayer 2014) and with increasing availability of dyadic migration data also more often applied to migration studies (e.g., Beine and Parsons 2015; Bertoli and Moraga 2015; Czaika and Parsons 2017; Beine and Parsons 2017) and specifically refugee migration (Dreher et al. 2019; Echevarria and Gardeazabal 2016).

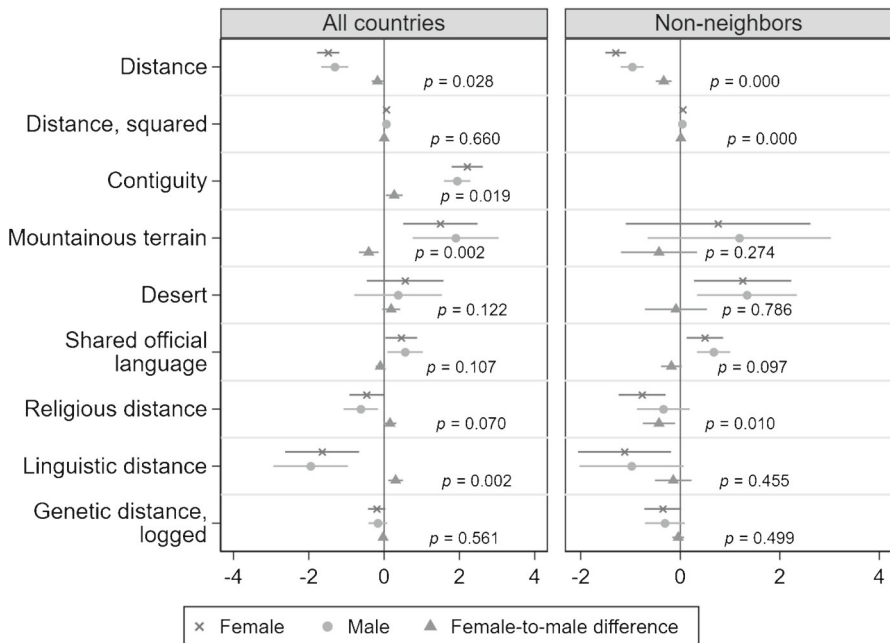
## 5 Results

We present coefficient plots of the main specification for each dimension to ease the interpretation of our analysis using stacked and fully interacted estimation. The plots

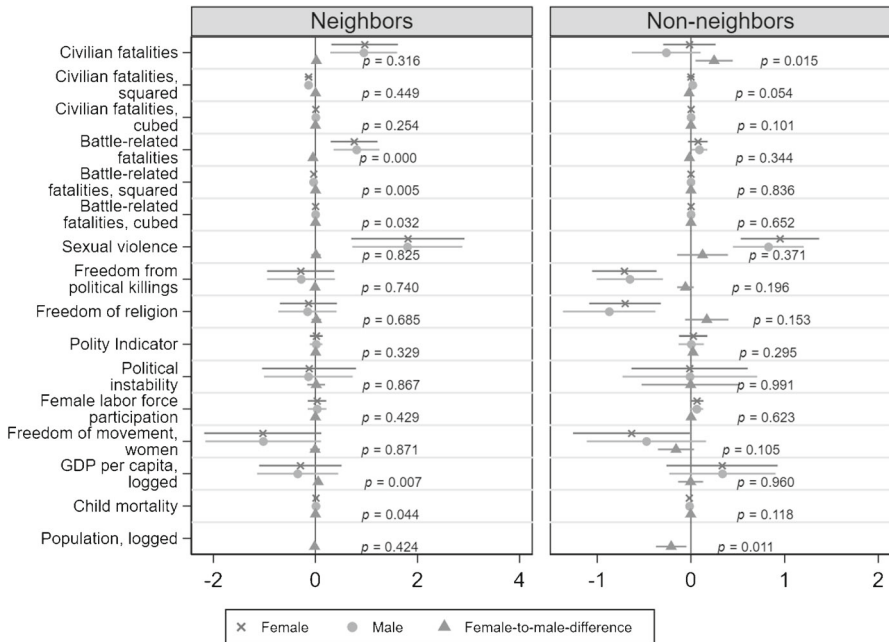
<sup>15</sup> The estimator cannot accommodate negative flows. As explained above and similar to Bertoli and Moraga (2015), we set those flows to zero. As a robustness check, we drop all negative flows, which does not change the results substantially (see Tables C-5, C-6, C-7, C-9, C-11, and C-13). Other studies use a two-step model that assesses selection into positive refugee stocks (see for example, Rügger and Bohnet 2018; Moorthy and Brathwaite 2016; Moore and Shellman 2007). They argue that the process of flight follows two connected but consecutive processes. However, we are only working with the subset of countries that receive positive inflows of refugees at some point, so this two-step procedure is not suitable for our approach. Furthermore, Echevarria and Gardeazabal (2016) argue that this process cannot be adequately disentangled and that PPML estimators can be applied for data with a large number of zeros.

show the effect (coefficient and confidence interval) of various flight determinants on male and female refugee flows. The focal point of our research question, the female-to-male difference, is the interacted term for each factor. The coefficient plots illustrate the interaction term, which is labeled with its  $p$ -value. Note that two separate regressions are combined in these plots: One interacted estimation for the direct effect on male and female refugees, respectively, and another one including the full factorial to derive the female-to-male difference and its  $p$ -value. To allow for differential effects by (non-)contiguity as discussed in Section 2.4, we split the sample and analyze neighboring and non-neighboring country pairs separately. Although less than 10% of the observations are classified as contiguous, about 90% of refugee flows occur in this sub-sample. The results for the full sample are available in the Appendix in Tables C-15 and C-16.

In Figs. 2, 3, and 4, we show the results of our preferred specification for each of the three dimensions: cost, push and pull factors. The corresponding tables are provided in the Appendix, Tables A5-A10. These tables also depict the step-wise inclusion of variables alleviating collinearity concerns. We add variables step by step and observe the effect it has on the results. For some variables that are correlated, we study how the exclusion of one affects the other (e.g., GDP per capita and child mortality).



**Fig. 2** Effects of cost factors on refugee flows by gender. Notes: Results of two PPML regressions with refugee flows by gender as the dependent variable: an interacted estimation for the male and female total effects and an estimation including the full factorial to derive the female-to-male difference and its  $p$ -value. Coefficients and confidence intervals are shown for male and female flows as well as for the interaction term, which depicts the female-to-male difference. The  $p$ -value indicates whether the difference is statistically significant. Origin-year fixed effects, destination-year fixed effects, and constant are included but not shown. The corresponding results are displayed in Table A-1, column (6) and A-2, column (4) in the Appendix



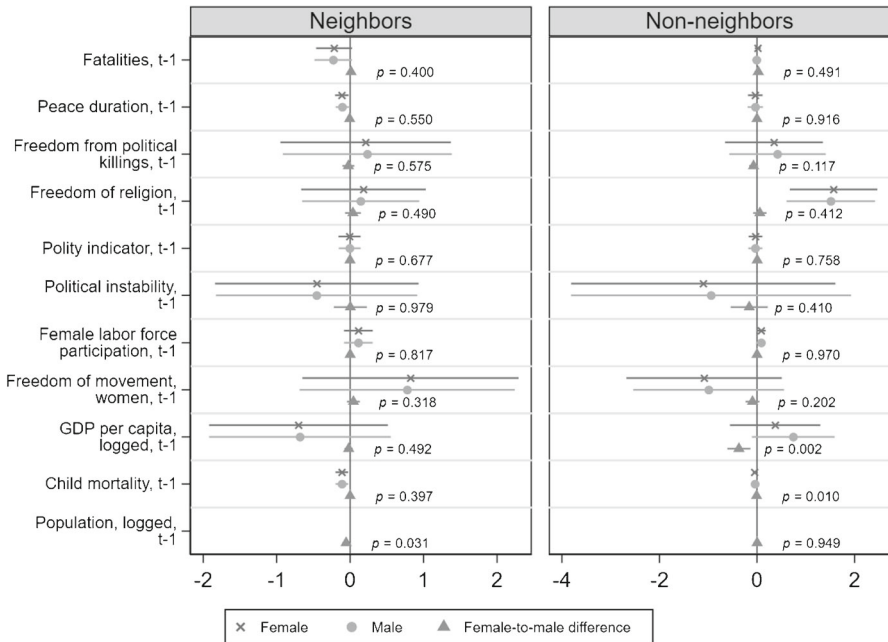
**Fig. 3** Effects of push factors on refugee flows by gender. Notes: Results of two PPML regressions with refugee flows by gender as the dependent variable: an interacted estimation for the male and female total effects and an estimation including the full factorial to derive the female-to-male difference and its  $p$ -value. Coefficients and confidence intervals are shown for males and females separately as well as for the interaction term, which depicts the differential gender effect or the female-to-male difference. The  $p$ -value indicates whether the gender difference is statistically significant. Origin fixed effects, destination-year fixed effects country pair fixed effects, and constant are included but not shown. The corresponding results are displayed in Tables A-3 and A-4, column (12) in the Appendix

Moreover, we test alternative measures (e.g., for geographic distance) or show results for theoretically relevant but potentially endogenous variables (e.g., diaspora).

### 5.1 Cost factors

The results for the cost dimension (see Eq. 6) are displayed in Fig. 2. Here, we analyze the full and non-neighboring sample by looking at time-invariant dyadic factors. We do not use the sub-sample with only neighboring country pairs as the variation in the time-invariant distance and relatedness measures is rather small for this sample, so that collinearity may become problematic.

**Distance** In accordance with earlier findings, longer distances are negatively associated with male and female flows in both samples. The female-to-male difference is significant and negative, suggesting that distance is a greater barrier for women than for men, in line with *H1a*. The coefficients on contiguity in the left panel also support this pattern, suggesting that refugee flows are significantly higher if countries are neighbors. Again, the female-to-male difference indicates that this effect is more



**Fig. 4** Effects of pull factors on refugee flows by gender. Results of two PPML regressions with refugee flows by gender as the dependent variable: an interacted estimation for the male and female total effects and an estimation including the full factorial to derive the female-to-male difference and its  $p$ -value. Coefficients and confidence intervals are shown for males and females separately as well as for the interaction term, which depicts the differential gender effect or the female-to-male difference. The  $p$ -value indicates whether the gender difference is statistically significant. Asylum country fixed effects, origin-year fixed effects, country pair fixed effects, and constant are included but not shown. The corresponding results are displayed in Tables A-5 and A-6, column (10) in the Appendix

pronounced for women. Further, the effect of distance is diminishing, i.e., the longer the distance, the smaller the deterring effect of an additional kilometer on the number of refugees.<sup>16</sup>

**Route characteristics** Looking at the riskiness of the route, we find that more mountainous terrain along the route correlates with a higher number of male and female refugees in the *full sample*. Although this is surprising in the first place, it may reflect the irregularity of the journey that refugees face compared to legal migrants. In the civil conflict literature, mountainous terrain has been linked to increased conflict, as it provides insurgents a place to hide from government forces (Buhaug and Gates 2002; Fearon and Laitin 2003). Analogously, it could provide refugees (and smugglers) protection from the police or border controls (for anecdotal evidence, see Moore and Shellman 2006, p. 617). This association is less pronounced for women, as the negative and significant female-to-male difference indicates, partly supporting hypothesis

<sup>16</sup> A test for a U-shaped relationship following Lind and Mehlum (2010) confirms this. The maximum is approximately 11,000 km, which is almost twice the average distance traveled.



*H1b*.<sup>17</sup> Also for flight into *non-neighboring countries*, tougher route characteristics do not seem to reduce refugee flows. Higher shares of desert along the route are associated with higher refugee flows. This may reflect the Sahara desert which needs to be crossed when fleeing from Sub-Sahara Africa to the north. Surprisingly, the association still holds when excluding the transit countries in North Africa (see Table A-16, column (4)).

**Relatedness** Turning to *H2a*, we explore relevant relatedness factors between origin and asylum country, such as common official language, linguistic, religious, and genetic distance. While genetic distance is not significant, the three other variables correlate significantly with the size of refugee flows in such that a stronger relatedness between these countries increases flows. With respect to gender difference, we find that this effect is largely stronger for men than for women — a result that contradicts our hypothesis. For both samples, a common official language increases male flows significantly more than female flows. Further, in the *full sample*, the negative effect of linguistic and religious distance is more substantial for male flows than for female flows. For *non-neighboring countries*, some results also slightly support *H2a*. When destination countries are not contiguous, women favor religiously close countries significantly more than men.

**Diaspora** While the network effect, which is addressed in *H2b*, is important from a theoretical point of view (see, e.g., Beine et al. 2011 for migrants, or Moore and Shellman 2007 for refugees), it is difficult to analyze due to its high risk of endogeneity, as discussed in Chapter 3. Therefore, we do not include the diaspora variables in our preferred specification. However, results are shown in Tables A-1, columns (9)–(11) and A-2, columns (7)–(9). An increase in the stock of legally registered migrants increases refugee flows without any gender difference in both samples, while the (gendered) refugee diaspora has no effect. Hence, *H2b* is not supported.

## 5.2 Push factors

**Conflict and violence** Looking at factors that make people leave their origin country (Fig. 3), we observe that — in line with the existing literature — violence has a strong and significant impact on decision-making. For both genders, more conflict-related fatalities (civilian and battle-related) are associated with higher refugee outflows to *neighboring countries*, as shown in the left panel of the Fig. 3. Here, the significant conflict variables follow a cubic relationship, indicating that the increase of refugee outflows per additional fatality is higher for both, small and large numbers of fatalities, i.e., for very mild and very intense conflicts. We observe a significant gender difference that indicates that the push effect of battle-related fatalities is smaller for women than for men. This supports hypothesis *H3a* and may be explained by men being more vulnerable due to their involvement on the battlefield, and at the same time having a higher agency about the decision to flee as well as fewer family obligations in their home country than women usually do. This gender difference is also significant for the

<sup>17</sup> Adding the number of border crossings (Table A-1, column (7) and A-2, column (5)), does not change the results and the coefficients are not significant.

squared and cubed term, however, at very low levels. We therefore cautiously reject *H3b*, since the data suggest that the pattern of significant gender differences exists independent of the conflict intensity.

Interestingly, flight to *non-neighboring* asylum countries exhibits a different pattern which does not support *H3*: Here, relevant push factors are political killings, religious freedom, and battle-related fatalities, all without a significant gender difference. Considering that movements into non-neighboring countries come with higher costs and typically require more planning it seems plausible that they are less a result of a rather sudden-onset conflict than of persecution and the slow process of taking away freedoms from parts of the society.<sup>18</sup>

Regarding strategies used in conflicts, we find mixed results: Civilian fatalities are positively associated with refugee outflows into *neighboring countries* with the number of fatalities showing a non-linear relationship, however, without any gender differences. For flight into *non-neighboring* countries, the number of civilian fatalities does not play a relevant role, nevertheless, the gender difference is significant: civilian fatalities increase female flows more than male ones. This can be interpreted as weak support for *H4a* for non-neighboring countries. Surprisingly, the prevalence of sexual violence in conflict is a significant determinant for refugee migration among both men and women equally, which means that hypothesis *H4b* must be rejected.<sup>19</sup>

**Gender inequality** Concerning the issue of gender inequality, we cannot find a differential effect on male and female flows. The results suggest that more rights and participation for women in the origin country tends to decrease outflows to *neighboring* countries and increases those to *non-neighbors*, independent of gender.

**Economic and political factors** Lastly, the exploration of economic and political variables of the origin country shows minor associations with the decision to flee and its gender differences. Within *neighboring* country pairs, the significant female-to-male difference suggests that a lower mean income (GDP per capita) in the origin country is associated with greater levels of male flight compared to females. In contrast, female flows increase significantly more than male flows in the case of extreme poverty (high child mortality rate). For the *non-neighboring* sample, GDP per capita does not seem to play any role for the (gendered) flight decision. Extreme poverty, however, is an obstacle to flight to countries that are not contiguous; an effect that tends to be more pronounced for females than for males. Thus, we gather that for flight into neighboring countries, men are more driven by a decreasing mean income

<sup>18</sup> Addressing the issue of planning horizons and lagged decision-making, we analyze conflict dynamics in an extension. Table C-2, columns (2)–(4) show that for flight into neighboring countries, mainly current and to a lesser extent previous year's civilian fatalities are determining factors. Similarly, for the non-neighboring sample (Table C-4, column (5)), sexual and political violence variables only have an immediate but no lagged impact on refugee flows. We cannot observe any gender difference in response to lagged conflict dynamics. Further, in our sample, neither length, duration, nor the specific year of an ongoing conflict is relevant (see Tables C-1 and C-3).

<sup>19</sup> Replacing the binary variable prevalence of sexual violence in conflict with a measure of the intensity of sexual violence in conflicts does not change the results. Moreover, excluding the variable from the estimation (as done in column (5) of Tables C-8 and C-10) also yields similar results, indicating that the effect of sexual violence on refugee flows is not captured by another variable.

while women are more driven by extreme poverty. Further, extreme poverty impedes flight to non-neighboring countries, especially for women. This corresponds to the literature on voluntary migration, which finds that poverty constraints matter for the selection of emigrants, affecting women and low-skilled individuals to a greater extent (Belot and Ederveen 2012), or showing that wealth constraints are relevant in poor countries and stronger for women's migration intentions (Dustmann and Okatenko 2014, p. 60). Changes in the level and stability of democracy are not significant across both samples and genders.

### 5.3 Pull factors

**Conflict and violence** As conflict and violence are relevant push factors, they are also likely to be relevant to the choice of a destination. Results shown in Fig. 4 for *neighboring* countries support this notion, since increased fatalities in the asylum country are associated with a decrease in refugee inflows. Counterintuitively, an increase in the number of peaceful years in a row in the asylum country also has slightly negative effects. For both, the female-to-male difference is not statistically significant; hence there is no support for hypothesis *H5a*.

In the *non-neighboring* sample, religious freedom has a positive effect on refugee flows but no significant female-to-male difference exists. Hence, *H5b* is not supported and it appears that more religious freedom in a *non-neighboring* asylum country is a motivating factor for both female and male refugees similarly. Freedom from political killings has neither a direct effect on refugee flows nor a gender-specific effect, leading to the rejection of *H5b*.

**Gender inequality** Turning to women's rights, the association is only significant for *non-neighboring* countries, but no significant gender differences exist. A higher degree of female labor force participation attracts male and female refugees alike into *non-neighboring* countries. Accordingly, *H5c* is not supported.<sup>20</sup>

**Economic and political factors** Mean income in the asylum country matters only for *non-neighboring* countries in a positive direction, i.e., increasing refugee inflows. Note, however, that this result has to be treated with caution since does not hold in most of our robustness checks. The female-to-male difference is negative and significant, indicating that the pull effect of GDP is stronger for males than for females. Similarly, severe poverty in a destination country has a negative effect on refugee flows,<sup>21</sup> however, with a stronger effect on females as indicated by the negative and significant female-to-male difference. This finding matches the observations for push factors, where women show a stronger response to severe poverty than men. However,

<sup>20</sup> In column (6) of Table C-12 and Table C-14, we replace freedom of movement with *property rights for women*, also from V-Dem. This does not change the results in the neighbor sample. In the non-neighboring sample, the property rights variable is significant. It seems to capture part of the effect of female labor force participation, which loses its explaining power. The female-to-male difference is still not significant.

<sup>21</sup> In our preferred specification, this relationship also holds for *neighboring* countries, but is not robust to many of our modifications.

this finding should be viewed cautiously, given that the significant effects are not robust to modifications such as dropping top countries in terms of conflict or refugee outflows.

Political factors such as democracy or political stability do not seem to impact flight decision, regardless of gender and (non-)contiguity of countries.

## 6 Robustness checks

Our analysis shows interesting correlative results. However, concerns about selection, omitted variables, or endogeneity may weaken the findings. Thus, we run a variety of additional estimations to test the robustness. The detailed results can be found in Tables C-5 to C-14. In the following, we briefly describe our tests.

**Changes to the sample**<sup>22</sup> First, by excluding the top outflow countries, Syria, Afghanistan, Iraq, South Sudan, and Somalia, we test whether these countries drive the results. Similarly, we exclude the five countries with the most conflict fatalities, Syria, Afghanistan, Iraq, Mexico, and Nigeria. Given these substantial modifications of the sample, we find a surprisingly small impact on our main results in both cases. The most notable changes are (i) for neighboring countries, the positive effect of battle-related fatalities on refugee outflows turns negative without any gender difference, and (ii) relatedness factors play less of a role in the flight decision.

We further exclude transit countries, Morocco, Algeria, Tunisia, Turkey, Mali<sup>23</sup>, to minimize the bias that occurs due to refugees not being counted in their final destination but on the route to Europe, for example. The analysis yields essentially the same results.

**Changes to the dependent variable**<sup>24</sup> As explained in Section 3.1, in our preferred model we set all negative refugee flows to zero. Alternatively, we drop all observations with negative flows following Beine et al. (2011). Although this reduces the number of observations by 15–20%, it does not change the results substantially.

To reduce the impact of a few very large refugee flows and smooth the distribution of flows, we log the dependent variable; an approach also followed by Dreher et al. (2019) or Beine et al. (2011). We add 1 to all flows before taking the log in order to keep all zero observations in the analysis.<sup>25</sup> For the logged dependent variable, we apply an OLS regression. This does not systematically change the results; however, significant gender differences in distance or conflict fatalities disappear. Yet, this is no

<sup>22</sup> The results for the sample changes can be found in columns (2)–(4) in Table C-5, C-6, C-7, C-9, C-11, C-13.

<sup>23</sup> There is no uniform definition of transit countries. The Maghreb is highly relevant for routes into Europe (e.g., Herbert 2022) and Mali has been reported to be a relevant transit country as well (<https://www.iom.int/news/mali-remains-country-emigration-and-transit-iom-migration-profile-confirms>).

<sup>24</sup> The results for the changes in the dependent variable can be found in columns (5)–(8) in Table C-5, C-6, C-7, C-9, C-11, C-13.

<sup>25</sup> Note that Echevarria and Gardeazabal (2016) emphasize the incompatibility of this transformation with the gravity model.

surprise as Silva and Tenreyro (2006) also find quite different results when applying the PPML estimator to the gravity equation as compared to the (prior) standard approach of running an OLS estimation in the log-linearized specification.

Using stocks instead of flows — as done, for example, by Grogger and Hanson (2011) for migrants and Neumayer (2005b) or Hatton (2004, 2009, 2016) for asylum applications — we see no major deviations in the cost and pull dimension. For push factors, however, conflict fatalities are no longer a driver for flight into neighboring countries. Instead, income seems to play a more significant role. For non-neighboring countries, gender differences in flows related to civilian victims disappear. The coefficients decrease drastically in size but their directions remain the same. It should be mentioned, though, that this approach conflicts with the foundations of the gravity model (see, e.g., Beine and Parsons 2015).

**Further control variables**<sup>26</sup> In order to address a potential omitted variable bias or measurement error, we test whether the inclusion or replacement of covariates changes the results substantially. Following other studies of refugee migration (e.g., Davenport et al. 2003; Moore and Shellman 2006; Neumayer 2005b; Hatton 2017), we include the *Political Terror Scale (PTS)* (Gibney et al. 2020) indicator in our analysis. This variable captures the existence of human rights violations by agents of the state and is highly correlated with our measure of freedom from political killings. Thus, we use them as alternative measures and not in combination. Similarly, we test *freedom from torture* from the V-Dem data set (Coppedge et al. 2021). Both show largely the same behavior as freedom from political killings and the remaining results are unchanged. As a pull factor to non-neighboring countries, however, low levels of political terror seem an attractive factor for all refugees, while freedom from torture shows this association significantly more for males than for females.

A growing, however still inconclusive, literature studies the effect of climate change on migration (see, e.g., Helbling et al. 2023, for an overview). We therefore include three climatic variables: precipitation and temperature deviation from their mean (1971–2001) (taken from the Climatic Research Unit, University of East Anglia (CRU CY4.06)) as well as a binary variable whether a natural disaster has occurred in a specific country-year (data taken from Emergency Events Database EM-DAT). The results show no significant effect of either of these variables on refugee flows. Further, the effect of the other push variables remains stable.

Another asylum country factor that potentially affects male and female flight decisions differently is the education situation, which could be relevant for families or a signal for economic development. Proxied by the number of years of schooling (Barro and Lee 2013), we account for this possibility. The coefficient on schooling is insignificant, and the inclusion does not change the results substantially.

The legal regulations concerning the entry of refugees into a specific country can substantially affect observed refugee flows and the decision-making of refugees, given they know about such regulations. To account for these potential barriers, we include a measure of de jure refugee and asylum policies which comprise refugees' entry, services, and livelihood in a destination country. Data comes from the Developing World

<sup>26</sup> The results for additional variables can be found in Tables C-8, C-10, C-12, C-14.

Refugee and Asylum Policy (DWRAP) data set (Blair et al. 2022). Surprisingly, more liberal refugee policies seem to reduce the number of inflows into a neighboring destination with a significantly stronger effect on men. However, we should be aware that the data reflect de jure regulations, and we have no information as to what extent these regulations are implemented or applied and whether refugees are informed. Additionally, within-country variation over the time period studied is somewhat limited, which may distort the results.

## 7 Concluding discussion

In this study, we empirically examine gender differences in the decision to flee among African and Asian refugee movements. Our results show that the costs of fleeing affect the flight decision for men and women differently: Women are significantly more likely to flee to neighboring countries and to go shorter distances than men. This pattern may reflect a higher vulnerability of women on the journey (with respect to (sexual) attacks and physical strength) as well as a higher probability of women being accompanied by children or elderly family members. Additionally, we find that extreme poverty in the origin and in the asylum country is more relevant for females compared to males, both as a push factor and as a barrier. In contrast, males tend to react more strongly to per capita GDP in the origin as well as in the asylum country. Cost-reducing factors of relatedness between origin and asylum country are a relevant determinant of refugee migration, but the effects on men and women vary only slightly.

For refugees overall, flight into neighboring countries is often driven by conflict, whereas political and religious oppression are motivating factors for flight into non-neighboring countries. With increasing numbers of battle-related fatalities, significantly more men flee to neighboring countries.

For other factors, it seems that men and women are more similar than initially hypothesized: For our newly compiled data on geographic characteristics of the flight route, we do not observe a gender-specific response. Also, sexual violence as a conflict strategy does not have a differential effect for men compared to women. Similarly, we find no gender difference based on the level of security and gender equality in the destination country.

As most studies of migration and particularly refugee movements, this one also has some limitations with respect to the data gathering and the documentation of such flows. The results of this study are based upon registered refugees who meet the criteria according to the 1951 Geneva Convention. Yet, we are fully aware that there are many cases of unrecognized refugees who are not registered by any authority or the UNHCR and are thus, not included in our data. Additionally, as refugees are only registered when entering a country, we do not know whether they stay in the country or proceed to another country which may lead to the double-counting of individuals in more than one country (see also Section 3). Hence, with currently available data the accurate calculation of dyadic refugee flows is very challenging and more precise data is required to improve the understanding of the dynamics of refugee flows.

Another drawback that we encounter in this study is the difficulty to find effects based on variation over time in a regression with slow-moving variables. Since we apply a rich set of fixed effects (e.g., country-year fixed effects), we can only study the effect that arises from the variation of a variable in a country over time. When looking into the data, we see that annual variation of variables like gender equality or democracy is relatively low compared to its overall variation which includes the variation between countries. It would be possible and perhaps in some way also be meaningful to relax this constraint and exclude country-year fixed effects. However, then we are not able account for fixed unobserved differences between countries that vary over time and therefore cannot be sure whether the measured variation comes from the observed variables or any other related unobservables such as cultural norms in a country or geographic characteristics, just to give some examples (Green et al. 2001). After careful consideration, we, therefore, come to conclusion that in this set-up we would like to choose the inclusion of fixed effects and therefore the reduction of an omitted variable bias for the sake of smaller variation in the data and the difficulty of finding significant effects.<sup>27</sup>

Lastly, this study contains a lot of different aspects that may have to do with gender differences in refugee migration. The empirical analysis is a cross-country analysis with a rich dataset, however, with a large number of fixed effects and related variables included. It is supposed to serve as a first approach to this topic and a starting point for further research in various directions. To be able to specify the model more precisely it may help to focus on one variable of interest. One interesting aspect, for example, is to look deeper into the effect that geographic distance has. Other measures could be developed based on our road-based distance measure. It may, for instance, be meaningful to use the distance between the centroid of the origin country and the closest border of the destination country, as it is likely that refugees mainly stay in the border region.<sup>28</sup> Further, the differential effect of economic variables, such as GDP and extreme poverty (in our study proxied by child mortality) is worth a closer look. Moreover, the theoretical pathways of how gender differences potentially evolve (see Section 2.2) is an interesting avenue for further research. It would be valuable to explore more specifically how differences in physical attributes, risk preferences or cultural norms can influence the decision to flee for males or females. As this study is a cross-country study including more than 90 African and Asian countries, another strand of complementary research would be case studies on a country- or region-level. This set-up would give the possibility to reduce the number of fixed effects and allow for a more in-depth analysis.

The political relevance of this study is highlighted when looking at potential consequences of refugee in- and outflows for destination and origin countries (for a comprehensive overview, see Becker and Ferrara 2019). Despite the fact that very few studies consider the individual characteristics of refugees, it is clear that getting a better understanding of refugees' needs and backgrounds helps to develop and facilitate more targeted policies. For example, integration policies in asylum countries may

<sup>27</sup> For a more in-depth discussion of fixed effects in pooled cross-sectional data, see, e.g., Green et al. (2001) and Beck and Katz (1995, 2001).

<sup>28</sup> This idea goes back to an unknown reviewer.



be more efficient if they consider the composition of refugee inflows. Different patterns between men and women have been found for labor market integration (Brell et al. 2020; Azlor et al. 2020; Bakker et al. 2017; Ala-Mantila and Fleischmann 2018), the effect of early childhood education availability on social inclusion (Gambaro et al. 2021) as well as factors associated with psychological distress (Thapa and Hauff 2005). At the same time, refugee movements may result in demographic imbalances in origin or asylum countries. Emigration of high-skilled females, for example, may have negative consequences on education and health in the origin country (Dumont et al. 2007). Further, there is evidence that gender equality, be it in terms of equal rights or simply sex ratios within a population, fosters economic growth (e.g., Duflo 2012; De la Croix and Vander Donckt 2010; Branisa et al. 2013) as well as the stability of nations (e.g., Hudson and den Boer 2004; Dahlum and Wig 2020; Hudson and Hodgson 2020). Thus, understanding and potentially predicting the drivers for gender differences in refugee movements may benefit policymakers in regulating flows and enacting meaningful policies for migration and integration.

In the specific context of this study, policy implications mainly build on the deterring effect of distance and borders for women. Considering that women are often accompanied by children, we can derive that neighbors of conflict-ridden countries have a greater need for infrastructure that supports families. Moreover, labor market integration and language programs in these countries can be more specifically directed at women and their needs as caretakers within the family. Finally, we advocate for safe and legal flight journeys, especially but not only for women, given the considerable deterring effect that geographic distance has on refugee flows. Refugees who fall under the 1951 Geneva Convention deserve protection, both in the country of asylum and on their way there.

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## Declarations

**Conflict of interest** The authors declare no competing interests.

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