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Forced Displacement, Migration and Fertility in Burundi — Source link

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Forced displacement, migration and fertility
Evidence from Burundi

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Abstract

The civil war in Burundi (1993–2005) led to the forced displacement of a large part of the population. This study aims to explore how that displacement impacted individual fertility behavior. Using a nationally representative, retrospective survey on birth and residential histories of 4,523 Burundian women, we examine the impact of war-induced displacement on fertility. These unique data enable us to distinguish between forced displacement, voluntary migration and non-migration on the one hand, and between instances of moving versus residence in the new site on the other. Adopting a semi-parametric regression model, we analyze both the probability of the first pregnancy and the subsequent spacing between higher order pregnancies. We find that the risk of a first pregnancy was higher in the year in which a woman was forcibly displaced and lower in the year a woman migrated voluntarily. Residency in a new site increased the risk of pregnancy.

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1. Introduction

Armed conflict and the associated population movement may upset normality in every aspect of society, including its reproductive regime (Agadjan and Prata 2002). Theoretically, armed conflict can both imply a reduction and an increase in fertility, and there is mixed empirical evidence for both (Urdal and Che 2013). Indeed, the relationship between war and fertility is complex and multidimensional. It depends on variations in the location and intensity of warfare, on various types of population movement (including both voluntary migration and forced displacement), and on the resilience of different population groups. In this paper, we analyze the impact of conflict-related displacement and migration on reproduction, using the case of Burundi, a country which was plagued by civil war in the years 1993–2005, and where half the population was displaced at least once during this period (Verwimp and Van Bavel 2014).

According to Hill (2004) and Martin and Tirman (2009), fertility and reproductive health issues more broadly have tended to be of low priority in humanitarian crises. Public attention is drawn to information concerning the magnitude of refugee flows, of death tolls, and of numbers of injuries. Reproductive health has been regarded as a tanker, something that only changes course over the longer term, with little attention paid to the consequences of humanitarian crises for fertility, the major determinant of medium-term population dynamics. The number of studies on fertility in refugee or displaced person populations has been very limited (Hynes et al. 2002), with a recent book edited by Hugo et al. (2018) being a notable exception. Authors of different chapters in the latter (Hugo, Abbasi-Shavazi and Kraly in Chapter 1 and Agadjanian in Chapter 6) stress that forced displacement on the one hand and voluntary migration on the other are conceptual extremes of an entire spectrum of migratory behavior. Behavior that is categorized as ‘voluntary’ may not be an immediate response to a

violent event, but how much agency do people really have if an entire area is without employment opportunities? By the same token, even people living under the duress of an armed conflict have some degree of freedom regarding whether or not to take refuge, where to go and whom to accompany. As a preview of the data we will document in detail below, 30% of the Burundian women in our sample reported that they had experienced both at least one instance of forced displacement *and* once instance of voluntary migration. This indicates that they were able to distinguish between the two forms of population movement.

The issue of forced migration has attracted increasing interest within population studies over the last decades. There is a considerable cross-national literature showing that humanitarian crises resulting from i.a. armed conflict may affect fertility behavior (e.g. Agadjanian, 2018). However, there is a lack of studies focusing specifically on crises-related forced migration and fertility. This is largely due to the absence of adequate data. Because assessments of fertility of forced migrants are often commissioned by the agencies that work with the forced migrants' needs, such assessments tend to focus exclusively on forced migrants and rarely involve comparisons with voluntary migrants and non-migrants. The present study attempts to fill this gap.

Based on unique survey data with detailed individual migration and fertility histories from the Enquête socio-démographique et de santé de la reproduction (ESDSR 2002, Blayo et al. 2004), conducted in Burundi by the United Nations Population Fund (UNFPA), we analyze how the probability of *first pregnancies* and *spacing* between *higher order pregnancies*[i] reflect temporal and geographic variation in terms of various forms of population movement in the context of armed conflict. We further consider the extent to which different socio-economic and demographic characteristics condition the fertility responses to conflict and displacement. As a metric, we keep hazard ratios: namely, odds of

the hazard of an increment in an explanatory variable to the hazard of the baseline values of the same (categorical) variable. Due to the degree of detail in the data, we can go beyond the reach of previous studies which have compared the total fertility rate of refugee women with that of non-refugees (Verwimp and Van Bavel 2004). Tracking the individual migration and fertility history of a woman at each instance of displacement and migration, we are able to distinguish between the types of population movement (*forced, voluntary vs. neither*) as well as between the various stages of displacement or migration (*on the move* vs. *in residence*). As such, we employ a trajectory approach to the analysis of population movement and fertility (Triulzi and McKenzie 2013; Schapendonk and Steel 2014), accounting for year-by-year and place-by-place information on the marital status of the individual woman, the company she is in while on the move, and the loss of children. Our study is inspired by the work of Kulu (2005, 2006) on internal migration for Estonia, Austria and Poland, and also Avogo and Agadjanian (2008) on Angola. They found that war migrants had higher yearly probabilities of birth than either non-war migrants or urban natives, illustrating the more selective nature of war-unrelated migration, a result that we also find. However, our study fills an important gap in the literature: to the best of our knowledge, this article is the first to systematically test the impact of the various stages and types of migration on fertility in a conflict-affected country.

Based on partial maximum likelihood estimation of survival regressions à la Cox (1972), we find that, for first conceptions, the effect of *forced displacement* is different than that of *voluntary migration*. In addition, being in a stage of movement versus being established in residence in the new site also has a different impact. In the year of moving, forced displacement increases the probability of a first pregnancy by 25%, whereas voluntary migration reduces it by 32%. Residence in the forced displacement site also increases the

probability of a first pregnancy, by 17%, but residence in the new voluntary migration site increases the probability by 47% compared to no migration.

When it comes to spacing between higher order pregnancies beyond the first, we find that the risk of an additional conception is higher for the year in which the woman is forcibly displaced, whereas it is lower in the case of residence in the forced displacement site. We find that, compared to sedentariness, voluntary migration seems to have a statistically significant impact of 38% on reducing the amount of time before an additional pregnancy.

The remainder of the paper is structured as follows: Section 2 provides a review of selected works from demography, conflict, gender and migration studies, and offers a conceptual framework for studying the relationship between violent conflict, migration and fertility; Section 3 presents the data; Section 4 presents the econometric model; Section 5 provides the analysis discussing the results; and Section 6 concludes and ends with some policy implications of our work.

2. Pathways linking violent conflict, forced displacement and fertility

Women who are forced to flee from conflict face a number of risks and challenges. . Although the reproductive health problems that displaced women and children face often resemble those of other women and children in developing countries, many of them are compounded by the experience of forced displacement. Despite the growing international recognition that sexual and gender-based violence (SGBV) is a war crime, it continues to be used as a weapon of war (Martin and Tirman 2009; Cohen and Nordås 2015, Martin 2018, Wood 2018). When women are separated from their husbands or adult male kin in the chaos of flight, they are particularly susceptible to rape. Many factors contribute to the vulnerability

of displaced women and girls to sexual violence, also in camps for refugees or internally displaced persons (IDP). Camps are often over-crowded and poorly lit, and communal latrines may be some distance away, increasing the potential of attacks on women at night. Displaced women may also face significant risk of rape while picking firewood. Armed conflict and massive population movement in Burundi have led to a strong increase in rape and other forms of sexual violence (Zicherman, 2007). How does armed conflict, along with the associated economic, social and violent factors, impact the fertility levels among forcibly displaced women?

2.1 Migration and Fertility

Before we delve into the relationship between violent conflict, forced displacement and fertility, we draw on the literature on *voluntary* migration that has suggested three causal mechanisms linking migration to fertility (Jensen and Ahlburg 2004; Agadjanian 2018). Thereafter, we discuss their relevance for forced displacement in particular.

(i) The first mechanism linking migration to fertility is the *selection* effect. This refers to the self-selection bias. Migrants represent a non-random sample of the population in terms of their socio-economic characteristics, which are often associated with lower or higher than average fertility compared to non-migrants at the origin. Factors such as education, age at marriage and age at employment all have an impact on reproductive choices (Dustmann and Glitz 2011). Selectivity may also occur on the basis of unobserved heterogeneity in preferences and biology: on the behavioral side, these include the propensity to postpone childbearing, openness to change, or fertility aspirations; on the biological side, unobserved mother-specific fecundity can be a factor.

(ii) The *disruption* effect in childbearing, through spousal separation or a desire to delay childbearing until after the move, could also prevail. Such a mechanism would lower the fertility of migrants compared to non-migrants, at least temporarily. The impact of disruption, therefore, would be found in the timing of a woman's fertility and may only last a short duration. The disruption effect has been studied most often in the context of temporary migration. Sharma (1992), for example, explored the impact of temporary spousal separation on fertility in Tanzania and concluded that any relationship between migration and fertility is reflected only in cumulative fertility and that disruption was not a major factor driving temporary fertility. A high level of disruption could lead couples to make up for lost fertility by spacing births more closely after migration, as well as delaying the age at which childbearing is interrupted. It is necessary, therefore, to distinguish the potential effects of migration on cumulative fertility from those on immediate fertility. White et al. (1995) found that a residential move reduces the likelihood of childbearing in the year of occurrence, providing evidence for a disruption effect. Goldstein et al. (1997) examined migrant fertility under very restrictive state policy regarding mobility and family planning in a Chinese province and found that rural-urban migrants tended to have later first births, which the authors attributed to disruption, but it could also be explained invoking a selection effect. A disruption effect may also be modified by gender and the purpose of migration (Lindstrom and Saucedo 2000). If women migrate for marriage then disruption may not be observed, but rather a short-term spike in fertility might be. The importance of disruption will be accounted for in our analysis with the inclusion of variables that capture the company in which the respondent migrates.

(iii) *Adaptation* to the fertility regimes of the destination is a third explanatory mechanism linking migration to fertility. The adaptation theory has its roots in both sociological and economic theories explaining determinants of fertility (Findley 1980). Rural women moving

to urban areas may adapt to the prevailing social norms of having less children or may find a job, thereby increasing the opportunity costs of conception. For example, it is observed that women who migrated from sub-Saharan Africa or the Middle East to Europe have less children compared to women residing in the Middle East or sub-Saharan Africa, a behavior that may be explained partly through selection and partly adaptation.

According to Agadjanian (2018), the above mechanisms for selection, disruption and adaptation usually entertained by the literature on voluntary migration and fertility are also applicable, and perhaps even more so, to forced displacement – on the condition that they are tailored to the characteristics of the latter (Agadjanian 2018; Zetter 2018). While the selection argument may seem least applicable to the analysis of forced displacement and fertility behavior, the disruption explanation appears to be very fitting indeed. In the case of voluntary migration, the disruption of life by migration is usually planned for or at least expected. The disruptive effects of forced displacement on fertility, on the other hand, operate through disruption of coital activity because of partner separation or because of mental and physical stress resulting from flight, and, possibly, from increased risk of fetal loss.

2.2 Fertility and Violent Conflict: A Conceptual Framework

To date, relatively little systematic research has addressed how armed conflict and displacement jointly affect fertility outcomes. One exception is the conceptual framework put forward by Kenneth Hill (2004). He argues that we can study the effect of humanitarian crises on fertility by tracing the impact of three intermediate variables: intercourse, conception and delivery. In this article, we draw on Hill's theory by focusing on these

intermediate variables. In effect, the aformentioned mechanisms linking migration and fertility can only exercise their effect through the intermediate variables.

The first intermediate variable, *intercourse*, has an immediate impact on fertility when partners are physically separated due to the war, when entry into sexual union is delayed, when couples separate or when coital frequency is decreased due to e.g. stress. (Abbasi-Shavazi et al. 2018). Intercourse outside unions may increase, however, through coercion, rape, or transactional sex with the possibility of increased extramarital childbearing. Young men can be mobilized by the army or militia, as in the case of Eritrea (Blanc 2004). This in turn implies *delayed marriages* and *disruption* of intercourse due to the separation of couples. Violent conflict can also lead to an increase in the age at marriage and to an increase in the proportion of women that never marry. War may cause increased mortality among men, typically unmarried young men (Rustad et al. 2015). Women born in the same or slightly younger birth cohorts may find it difficult to find a husband, as the younger men usually prefer younger brides. In many developing countries, unmarried women occupy non-enviable positions in the household, often in the household of a sibling. *Late marriage* or *single status* will decrease the fertility of these women. Relatedly, during war or in periods of increased insecurity, it is rare that women marry at a young age. This may be linked to the need to provide labor on the farm or to generate income. The household may even attempt to recruit new members to replace the loss of male labor (Fafchamps and Quimsbuing 2006). Consequently, after the war's end, we might observe a spike in marriages in which young adults attempt to make up for lost time.

The effects on fertility via the second intermediate variable, *conception*, run through the (non)use of contraception, severe malnutrition, disease or breastfeeding. All four can be negatively affected by violent conflict and thereby change the rate of conception in the event

of intercourse (Che et al. 2015) . The magnitude of these impacts depends on the local context, the severity of the violence, and the potential breakdown of food supply, social norms and the availability of contraceptive means (see Section 3). Conflict-related stress can have a negative effect on both semen quality and the menstrual cycle, which in turn increases the risk of infertility.

The third intermediate variable linking humanitarian crises and fertility – *delivery* – refers to the potential dangers of giving birth in the midst of a crisis, which may lead to miscarriage or still birth. This is affected by the (non)availability of health services, medication and qualified staff (Østby et al. 2019). We will capture this element by the inclusion of previous still births in our analysis of higher order pregnancies.

There is evidence that violent conflict can have both positive and negative impacts on fertility levels and child-bearing. A number of studies have documented significant reductions in fertility during conflict, including Agadjanian and Pratas (2002) on Angola; Blanc (2004) on Eritrea; Caldwell (2004) in general on fertility transition; and Lindstrom and Berhanu (1999) on Ethiopia. In some instances, the end of a conflict is associated with a *fertility increase* (e.g. Caldwell 2004). A possible explanation for this is that parents may prefer short-term income from numerous children (*extensive margin*) over long-term return from fewer, educated children (*intensive margin*).[ii] Further, the observed spike in births may reflect a desire to replace children lost to the conflict. Nobles et al. (2015) refer to *replacement fertility* by individual women and to *population-rebuilding* in the context of conflict or other disasters with high overall death tolls. These authors found that mothers who lost one or more children in the 2004 Indian Ocean tsunami were more likely to bear additional children after the tsunami. Also, they found support for the so-called *population rebuilding* mechanism, whereby women without children before the tsunami also initiated family-planning earlier

after the tsunami. It is not unlikely that different population groups and segments of society will react to conflict in different ways. For example, better educated and more affluent people should be both more willing and able to control their fertility behavior in response to war (Agadjanian and Prata 2002, 218).

Violent conflict often leads to forced displacement and generates refugee flows. The effects of forced displacement on fertility have been studied with mixed results. In a study on the fertility of refugees in Rwanda, Verwimp and Van Bavel (2004) found that former refugees had higher fertility than other women. They attributed part of this to higher infant and child mortality. Jamieson et al. (2000) make a similar observation for Burundese refugees in a camp in Tanzania, reporting low birth weight and high fetal and neonatal death rates. However, reproductive health in general, and fertility behaviors in particular, may vary a lot in refugee situations depending on the overall conditions in the camps, the length of the stay, the access to health care and family planning, and so on. We may not necessarily expect conflict to have the same effect on fertility for internally displaced persons or refugees living in camps as compared to refugees living outside camps. In general, health conditions are likely to be worse for refugees that concentrate outside camps as these may not benefit from public services or international aid (Østby et al. 2019). Hence, it is also likely that access to family planning will be higher in the camps, leading to potentially lower fertility for internally displaced persons or refugees in camps than for non-camp refugees. In a comparative study of more than 600,000 people living in 52 post-emergency phase camps in six countries (Thailand, Myanmar, Nepal, Ethiopia, Uganda, and Tanzania), Hynes et al. (2002) found better reproductive health outcomes[iii] among refugees and internally displaced populations in these camps compared to the populations in both their respective host countries and countries of origin. Hynes et al. attribute their findings to better access for

camp residents to preventative and curative health care services, and to food and nonfood items, as well as improvements in water supply and sanitation.

Given these multiple mechanisms and the complexity of the relationship between conflict, displacement and fertility (here understood as the risk of pregnancy), we formulate a number of hypotheses. First, we expect that women who are on the move, be it voluntary or not, have less access to contraception and health facilities than non-migrants, which leads us to our first hypothesis:

H1: *Migrants have higher risk of pregnancy than non-migrants.*

Forcibly displaced women and their partners may be less able to make plans, both in general and with regard to the timing of childbearing. In light of this, and also accounting for the larger risk of sexual violence and rape faced by women who are forced to flee, our second hypothesis posits:

H2: *Forcibly displaced women have higher risk of pregnancy than voluntary migrants.*

Marriage and family formation are affected by the *process* of migration. The demographic literature on refugees and forced displacement often distingishes between various phases of migration: the flight itself (being on the move), settlement in the new area, and resettlement in the place of origin. We expect that women have less control over their fertility while on the move than women in residence.

H3: *Women on the move have a higher risk of pregnancy than women in residence.*

Finally, as discussed above, we assume that the access to health facilities and family planning services may be better for displaced women who reside in camps than for those who reside outside the camps:

H4: *Women who reside in a (IDP) camp have a lower risk of pregnancy than displaced women who do not reside in camps.*

3. Background on war, displacement and fertility regime in Burundi

Before colonization, the Kingdom of Burundi was characterized by a hierarchical political authority and tributary economic exchange, between the royal clan (Ganwa), Tutsi, Hutu and Twa. The Belgian coloniser preserved many of the kingdom's institutions and the monarchy succeeded in surviving into the post-colonial period. The country gained independence in 1962 but a series of assassinations, coups and a general climate of regional instability culminated in the establishment of a republic and one-party state in 1966. Civil war and genocide followed and left the country undeveloped and its population as one of the world's poorest.

The latest episode of civil war in Burundi began in October 1993, when paratroopers from the Tutsi-dominated army assassinated the first democratically elected president, Ndadaye (Hutu) in a failed coup d'état. This was followed by large-scale massacres in the countryside, with supporters of the president killing Tutsi and Hutu who supported the former regime, and the army killing all Hutus in sight in an operation ‘to restore order’. In a matter of days, about 100,000 people lost their lives in what the UN calls a genocide (UN 1996). The massacres were followed by the spread of violence and warfare throughout the country, with several Hutu rebel factions opposing the regular government (Tutsi) army. This marked the

beginning of one of the most brutal and bloody civil wars in recent history (Uvin 1999). Over subsequent years, the government placed hundreds of thousands of people in IDP camps, officially to better protect them from rebel attacks, unofficially to prevent them from offering support to rebel groups.

In August 2000, several rebel groups signed the Arusha peace agreements with the still Tutsi-dominated Burundian government. This had little effect on the security situation on the ground, as the two major rebel groups, CNDDFDD (Conseil National pour la Défense de la Démocratie) and FNL (Forces National pour la Libération), were not involved in the peace talks. In 2003, the new president (Hutu) announced a one-sided ceasefire and allowed the largest rebel group – CNDD-FDD – to descend from the hills and march victoriously on Bujumbura.

Rebel leader Pierre Nkurunziza was incorporated into the government and rebel combatants were integrated into the army and police forces. The intensity of the civil war decreased dramatically and, in 2005, Nkurunziza was elected as the new president. However, one rebel group (FNL) remained outside the peace process and continued to murder and pillage, leaving pockets of insecurity in the country. Human Rights Watch (1998, 2003) describes the Burundian war as a war against civilians. Civilians were widely used as proxy targets, with both sides (rebel groups and the regular army) targeting civilians deemed to be supportive of the other group. Direct battles between the army and the rebel forces were relatively rare, despite the duration of the war. Both sides of the conflict engaged in widespread looting of civilian property and massive human rights violations.

Civilians were forced to flee battle zones, losing their wealth and livestock in the process, before subsequently being put into IDP camps in often deplorable conditions. Displaced individuals and families were prone to attacks, deprivation, bad sanitation and housing

conditions and malnutrition. The massive population movement led to a strong increase in rape and other forms of sexual violence (Zicherman, 2007). Upon returning home, displaced people would find their land occupied by neighbors or strangers.

The armed conflict in Burundi further caused reduced access to and poor quality of maternal and reproductive health (MRH) care. Attacks on health facilities, killing of health personnel, and ethnic favoritism in the provision of health care were channels through which the conflict led to limited access and poorer quality services.

In their qualitative study from Burundi, Che et al. (2015) found that while some women found it hard to control their fertility due to the lack of family planning services, others reported wanting to have more children to replace their lost ones. The size of one's ethnic group was cited as an additional motivation. And culturally, large families are still considered a sign of wealth in some rural areas. In other words, a strong replacement effect coupled with a cultural desire for large families and the low uptake of family planning services could account for the high total fertility rate (Che et al., 2015).

In order to get an overview of the fertility regime as it existed prior to the conflict, it is useful to observe key findings from the 1987 Demographic and Health Survey (DHS) for Burundi (N=2,777), the data source giving information on fertility close to the onset of the civil war. This shows that married women were on average 19 years old when they first married, an age that also corresponds with the age at which women had their first intercourse. No less than 88% of the surveyed women report not using any form of contraceptive method at the time of the survey, be it traditional or modern. 44% do not know where they are in the ovulatory cycle and the desired number of children is 5.2. Thus, on the eve of the civil war, Burundi could be characterized as a very high fertility country where women have a lot of children and do not have control over the number of children they have (Hamidou and Guengant

2017). In fact, the gradual decline in the total fertility rate (TFR) in Burundi from 1970 to 2013 was slow, from 7.3 to 6.1 children per woman (Che et al. 2015).

4. Data

Data from the Enquête socio-démographique et de santé de la reproduction (ESDSR, 2002) [iv] are employed for the analysis. This nationally representative survey was conducted by the United Nations Population Fund to fill in the information gap generated between the end of the civil war and the previously collected census data in 1990, prior to the onset of the conflict. The ESDSR (2002) dataset is based on a *two-stage stratified cluster sample survey*, designed to be representative of the population at the national level, as well as at the rural, urban and IDP camp level. The survey collected information on 7,119 households, of which 3,181 were located in 40 IDP camps, 2,820 in 100 rural hills and 1,118 in 28 urban locations, with a total of 32,805 persons interviewed.[v] The general information obtained from the individual bulletins for both men and women pertain to *demographic characteristics*, namely year of birth, gender, marital status, year of marriage, year of separation (if any), nationality, religion; *socio-economic characteristics* such as schooling, occupational status, livestock held (number of cows, sheep, chickens) by the household at the time of the survey as well as before the start of the war; and health status, including whether a person survived the conflict, or, if not, causes of death. With the data at hand, we are able to study the effect of selection in to migration as well as the effect of intermediate variables such as *intercourse* (via separation and spousal union) and *delivery* (live births vs. still births). This covers two of the three aforementioned intermediate determinants of fertility. We are not able to analyze the impact of *conception* given intercourse, as the variables capturing this effect are only recorded in the survey for the most recent birth, not for all births. However, as mentioned before, given that

very few women report using contraception, we do not expect the (potential deregulation) of this mechanism to have a significant impact on our results. There is no ethnic variable in the data set, hence we are not able to control for or indeed test the potential effect of ethnicity.

The time-to-event panel dataset used for the analysis is the result of a merge of different STATA v.13 data files from the household survey. In particular, a micro-level right-censored dataset containing fertility histories of 4,783 mothers is merged with a panel containing the migration histories of the same group of individuals. The resulting dataset is shaped in *survival time* format, allowing us to study the length of yearly intervals occurring between subsequent *conceptions* as well as between subsequent *places of residence*. To each of the latter is associated a dummy variable defining the occurrence of a pregnancy, and the subsequent health outcomes of the child (still births and infant survival, distinguished by gender) and a variety of covariates (both time-varying and time invariant). A total of 4,523 women for which we have complete information on all covariates are included in the analysis. In this sample, 21.5% of the women were never displaced, 36.1% were forcibly displaced at least once (without any voluntary migration), 12.2% had voluntarily migrated at least once (without any forced displacement) and 30.1% had experienced both.

Table 1a describes key variables for the whole sample used in the analysis. We can see that, on average, the mothers interviewed were 33 years old, and two thirds of them had been forcibly displaced at least once during the nine years of the war, with an average duration of displacement over five years. Their average level of education is near to the completion of primary schooling. Concerning their religious orientation, 63% are Catholic, 28% are Protestant and 6.7% are Muslim (those remaining are ‘other’).

Table 1a. Description of key variables in the dataset, N=4,523

Meaning	Mean	Std. Dev.	Min	Max
1. Number of pregnancies	4.52	2.78	0	18
2. Women's age at time of survey	32.8	7.85	15	47
3. Level of schooling	0.83	0.56	0	2
4. Livestock pre-war in TLU	2.12	5.85	0	214
5. Frequency of moving (if at least once)	2.1	1.1	1	12
6. Duration of residence in new site (years)	5.3	3.5	0	10

Note: This descriptive table is at the woman level; the analysis will be conducted at the woman-year level. TLU=tropical livestock units.

Some background variables are categorical, namely education, taking values 0 for no education, 1 for at least some primary education and 2 for at least some secondary education; and religion, with 1 being Catholic, 2 Protestant, 3 Muslim and 4 'other'. For the migration variable, we distinguish on the one hand between forced displacement and voluntary migration, and on the other hand between years in which the displacement or migration took place ('moving') and the year(s) of residence in the new site ('residence'). In the questionnaire, women were asked for each episode of migration/displacement whether or not it was induced by the civil war. If the women answered 'yes' to this question we regard the event as forced displacement, in case of a 'no' answer we regard it as voluntary migration. The coding of a complex process as a binary event is never fully satisfactory: we are dealing with a spectrum of which voluntary migration and forced displacement constitute extremes. The element of choice is never entirely absent, but its influence is much smaller in cases of war-induced displacement. The element of coercion is never completely absent either, but is smaller in cases where the woman is not forced to flee the threat of imminent violence. We find support in the observation that the respondents clearly make the distinction between the two: 30% of all women in our sample have indicated that they have experienced both, meaning at least one episode of forced displacement and one episode of voluntary migration.

A year is defined as 'in residence' when no movement occurred that year. A year is defined as 'moving' when at least one displacement to a new site occurred in that year. This two-by-two, granular distinction is what makes the data and the analysis we present here unique compared to other migration and displacement data on the African continent. As a precursor to our results, we can compute the average probabilities of having a pregnancy depending on displacement/migration status in the years of the civil war. In a year when a woman was not displaced or migrating, she had a 22.0% probability of having a pregnancy. This turned into 29% in a year when she was forcibly displaced, to 22.2% when she resided in a displacement site, to 22.8% when she was voluntarily migrating (moving) and to 25.7% when she was residing in the new migration site. Obviously, these simple means need to be qualified in a proper regression framework.

The descriptive tables 1b and 1c show that women who were displaced or had migrated differ significantly on the main explanatory variables, indicating that there is selection into displacement and migration. In our analysis, we will control for all above variables in order to infer the effect of migration and displacement on fertility. Importantly, in the face of these pre-treatment differences, we do not claim to isolate the *causal effect* of displacement or migration on fertility, even though we believe that the endogeneity is larger in the case of voluntary migration and fertility as compared to forced displacement and fertility.

Figure 1 presents two features of the data. First, the survey sites: 168 in total, the rural ones in green color, the urban ones in blue color and the camp sites in red color. The black arrows represent an example of a typical displacement/migration trajectory of a woman in our survey. She is displaced/migrates more than once (including to places that do not end up in our sample of survey sites) before she ends up in a residence that will be selected as one of the survey sites and is thus registered in our survey. In contrast to other

displacement/migration crises, we notice that a large proportion of Burundese migrants do not go to cities; rather, their movement is often rural to rural or rural to a camp, the latter within the country or outside. The different places a woman migrated to/was displaced in, as well the duration of her stay in each of the sites, are registered in the data we use.

Table 1b. Comparing women who were never displaced with those who were forcibly displaced.

Variable	**Never displaced**	**Forcibly displaced**	**t-test**
Age in 2002	34.0	34.1	-0.1
Number of pregnancies	4.67	4.97	-0.3***
% Married before 1993	62	67	-5***
% Catholic	74	60	16***
Level of schooling	0.94	0.72	0.22***
Pre-War Welfare Proxy[#]	1.84	2.66	-0.82***
N	972	1,633	

Note: *** p<0.01, ** p<0.05, * p<0.1. [#] Tropical livestock unit as of 1993.

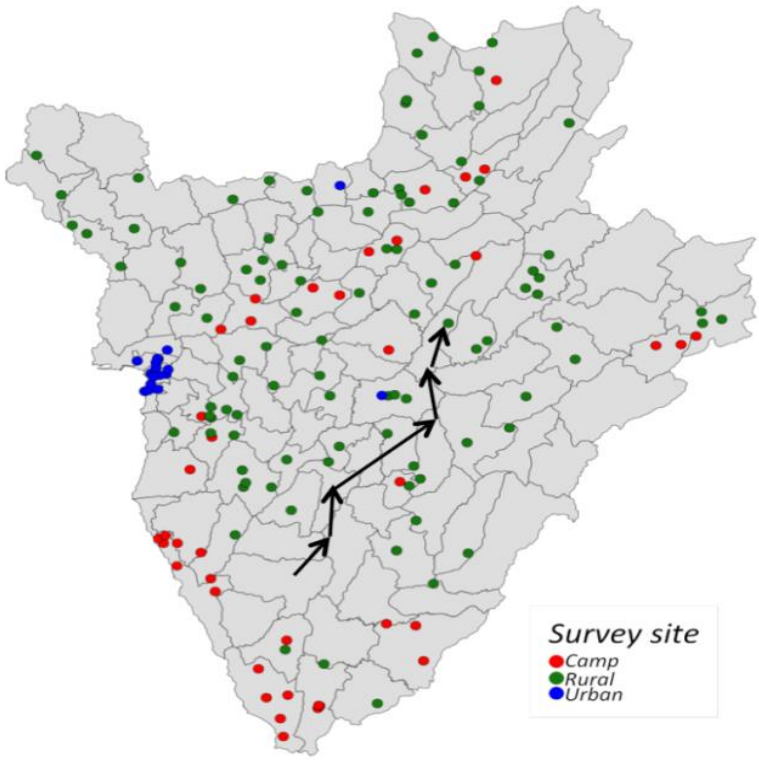
Table 1c. Comparing women who were never displaced with those who voluntarily migrated.

Variable	**Never displaced**	**Voluntarily migrated**	**t-test**
Age in 2002	34.0	32.5	1.5***
Number of pregnancies	4.67	2.72	1.94***
% Married before 1993	62	22	40***
% Catholic	74	63	11***
Level of schooling	0.94	1.12	-0.17***
Pre-War Welfare Proxy[#]	1.84	1.34	0.50
N	972	554	

Note: Descriptive tables 1a–1c are the woman level; the econometric analysis will be conducted at the woman-year level instead. The group of women (N=1,364) who are forcibly displaced as well as voluntarily migrated at least once is not included in the table. *** p<0.01, ** p<0.05, * p<0.1. [#] Tropical livestock unit as of 1993.

Figures 2 and 3 (in Appendix) show the patterns of statistics related to survival estimates in our data, presented at current residence of the interviewed women, either in an urban or rural zone or in an IDP camp. In particular, the graphs present the Kaplan-Meier survival and failure estimates as well as the Nelson-Aelen cumulative hazard and the smoothed hazard estimates. For single failures (i.e. onset of fertility), survival probabilities are lower for urban residents than for rural or camp residents. Nonetheless, this trend seems to invert for higher values of the analysis time, with rural and camp residents showing a lower probability of survival, i.e. a shorter time span before first conception. The estimated cumulative hazard appears to be lower for IDP camp residents. As for further failures (subsequent conceptions), the survival probability is always lower for urban than for rural citizens. Of course, women's current place of residence is often different from their sites of residence during the civil war. It is for this reason that we include the entire migration history of the women in our subsequent analysis.

Figure 1: Survey sites in the 2002 ESDSR survey in Burundi and example of a typical migration/displacement route



Note: Map created by authors based on geo-coding of survey site names from the ESDSR Survey in Burundi.

5. Econometric Method and Estimation Strategy

We assume that hazard ratios of occurrence of first pregnancies (*starting*) and hazard ratios of further conceptions (*spacing*) have a semi-parametric proportional hazards form, à la Cox (1972).[vi] Observations are censored, meaning that some of the mothers in the sample exit the *risk set* of fertility prior to the end of the observation period (year 2002), while others still remain fertile after the endline of the survey. We have to account for this fact while formulating the likelihood function whose maximization leads to the estimated parameters of

the models. In other words, some *intervals* are open, since the mother might eventually experience another conception beyond the survey endline.[vii]

The explanatory variables, both time varying and time invariant, affect the waiting time (expressed in mother-year metric) from zero to one pregnancy, from one to two, and so on, and the waiting time to event represents the dependent variable in our regressions. Two possible metrics can be chosen to fit semi-parametric survival regression models to the data, namely proportional hazards and accelerated failure time. We choose to adopt the proportional hazard metric as it is more easily adapted to interpreting results of a survival model with relatively constant or monotone hazards patterns:

$$\lambda(t\,|x) = \lambda_0(t|x)exp(\beta \boldsymbol{X} + \gamma \boldsymbol{Z}) \qquad (1)$$

We choose a multiplicative specification of the baseline hazard of the event occurring at a given time and the explanatory variables which enter linearly. *t* is survival time until first or higher order gestations or censoring time for individual; i = 1,..., 4,523 residing in village (or sampling unit); j= 1,...,168 and for all t = 1967,...,2002. $\lambda_0(t|X)$ is the baseline hazard (or *systematic* part of the hazard rate, regardless of the covariates), assumed to have a non-parametric form.[viii] $\boldsymbol{X}$ contains the displacement/migration variable, from specification to specification, while $\boldsymbol{Z}$ is formed by the control variables, namely age, age squared, education, religion, marriage status, livestock ownership as a proxy for pre-war wealth and company of the household while moving.

Firstly, we estimate a parametric survival model to explain first pregnancies (*starting*) in STATA v.13, via partial maximum likelihood methods to account for right censoring, including both time invariant and time varying regressors. The former includes a categorical variable for religious beliefs, one for educational attainment as of 1993 and an indicator of household asset holding (tropical livestock units in 1993).[ix] The latter contain mother's age

(with a rescaled value of 0 representing 12 years old) and marital status. Secondly, to explain the distance between higher order pregnancies (*spacing*), handling ties with the Efron method, a model analogous to the previously described one is estimated, also including a dummy variable for the likelihood of a previous still birth.

6. Results

6.1 General impact of displacement/migration on fertility

We start in Table 2 with one binary variable indicating whether or not the woman ever migrated, not distinguishing between forced and voluntary migration. The first column is concerned with the study of first pregnancy events, while the second column deals with pregnancies of order higher than the first in order to study *spacing behavior*. The table displays the results of running a Cox model with a semi-parametric baseline hazard.[18]

Table 2. Effects of **any displacement or migration** on time to first and higher order pregnancies.

	First conception	Higher order conceptions
	(1)	(2)
Migration (none control)		
Any Displacement	1.427***	1.557***
	(.086)	(0.095)
Age	1.033***	1.049***
Age^2	1.000***	1.000***
Education (none is baseline)		
Primary	0 .939*	0.898**
	(0.045)	(0.039)
Secondary	0.803**	0.757**
	(0.073)	(0.070)
Religion (Catholic is baseline)		
Protestant	1.010	0.999
	(0.047)	(0.046)
Muslim	1.465***	1.421***
	(0.136)	(0.132)
Other	0.926	1.235*
	(0.138)	(0.180)
Wealth (tlu1993)	1.000	0.998
	(0.003)	(0.003)
Married	1.275***	1.285***
	(0.007)	(0.007)
Company (no migration is baseline)		
Migrated alone	1.131*	1.015
	(0.089)	(0.081)
Migrated with some hh	0.927	0.955
	(0.145)	(0.156)
Migrated with entire hh	1.255**	1.238**
	(0.115)	(0.114)
Migrated with various hh	1	1
Number of still births		1.142***
		(0.112)
No. of observations	40,245	39,400
No. of subjects	4,391	4,391
Time at risk	40,245	39,400
Clusters	168	168

Note: Specification (1) displays the impact of any displacement on time to a first pregnancy under a Cox proportional hazards model, with coefficients measuring hazard ratios. Specification (2)'s dependent variable is time to higher order pregnancies. Wealth is measured in tropical livestock units. Efron method is adopted to handle ties. Standard errors are in brackets, significance level depending on p-value, *** p<0.01, ** p<0.05, * p<0.1.

Any form of migration with respect to no migration raises the risk of having a parity by 42.7%, which is in line with our first hypothesis. As for the covariates directly related to the displacement, we notice the importance of the company of the woman during her displacement, capturing the effect of (non-) separation. If she is alone, she has an increased risk of experiencing the event of 13%, which may be linked to the danger of being raped. As discussed above, rape was widespread in Burundi, as in other contexts of armed conflict and displacement. Single women or women migrating alone may run a higher risk of rape. We also find an increased risk of 25.5% when a woman migrates with her entire household, most likely not because of rape in this case, but because of the frequency of intercourse given the presence of her husband. In addition, the fact of being married or not in a given year has a rather high effect on the hazard of having a first birth (+27%). The age of the mother (a time varying covariate) has a neutral impact on the hazard ratio both of a first and of a higher order pregnancy. As for the other control variables, being Muslim raises the probability of having a first birth by about 46%, while finishing secondary school reduces such risk by about 20% if compared to no schooling. Pre-war household wealth, proxied by the amount of tropical livestock units as of 1993, does not seem to have a statistically significant effect on the probability of having a first birth.

As for higher order pregnancies, we present the results in the second column of Table 2. Here, any type of displacement reduces the length of the time to first conception by 55.7%, while being with the entire household when displaced raises the risk by about 24%. The effect of migrating alone is not any longer statistically significant in the case of higher order pregnancies, which could indicate that rape in particular affects younger, childless women. Primary and secondary education strongly diminish the risk of an additional child by 11 to 24% respectively, while being Muslim still has an effect, although slightly smaller if compared with the first conceptions (+42%). Being married increases fertility behavior even

beyond the first child gestation. In this estimation, we also control for whether or not the previous pregnancy resulted in a still birth or not. As noted in the conceptual framework, the latter can increase fertility to make up for the loss, something we indeed observe in the case of Burundi. These results call for a deeper analysis of the type of displacement, which we turn to now.

6.2 Voluntary vs. forced displacement and movement vs. residence

During civil war as well as peace, women and men make decisions about where they will live. Such choices must be distinguished from forced displacement, which unfortunately is frequently observed during civil war. Since our survey registered the two types of displacement (voluntary and forced), we can distinguish their effect on fertility. As discussed above, in the questionnaire, 'forced displacement' is defined as 'induced by the civil war' and captured by the term '*la crise*' in the question 'reason for migration/displacement'. '*La crise*' is the term used in Burundi for the armed conflict.

As voluntary migration may be endogenous to the desire to become pregnant, often linked to marriage in Burundi (see Verwimp and Van Bavel 2004), we first exclude all voluntary migration from the analysis and compare the effect of civil war induced forced displacement on fertility with women who were never displaced. Results in Table 3 show a 25% reduction of the time period before a first pregnancy when the woman was forcibly displaced. When the forced displacement takes place with her entire household, it increases the risk by 27%, while being married has by far the largest effect. Hence, for the separation/intercourse mechanism to be at work, it is crucial to know whether the woman has been displaced with or without a husband. Adhering to Muslim beliefs has a large positive effect (doubling the risk of a first pregnancy), while the impact of primary education is on the margin of statistical significance, though with a negative sign (i.e. reducing the likelihood of a first event). Continuing to higher

order pregnancies, we notice in the second column of Table 3 a strong and significant effect of being forcibly displaced (43.2%) as well as a 30% higher risk if the woman was accompanied during her displacement by the entire household. As before, education, especially secondary education, has a negative effect on the likelihood of a higher order conception. Muslim faith as well as experience of a previous still birth have positive effects, as in Table 2.

Table 3. Effects of **forced displacement** on time to first and higher order pregnancies.

	First conception	Higher order conceptions
	(1)	(2)
Migration (none is control)		
Forced displacement	1.247***	1.432***
	(0.076)	(0.087)
Age	1.001	0.984
Age^2	1.000	1.001
Education (none is baseline)		
Primary	0.942*	0.881**
	(0.039)	(0.036)
Secondary	0.883*	0.772***
	(0.064)	(0.055)
Religion (Catholic is baseline)		
Protestant	1.128**	1.159***
	(0.045)	(0.047)
Muslim	2.076***	2.060***
	(0.141)	(0.140)
Other	0.907	1.308*
	(0.129)	(0.181)
Wealth (tlu1993)	0.998	0.996*
	(0.003)	(0.003)
Married	1.292**	1.301***
	(0.126)	(0.003)
Company (no migration is baseline)		
Migrated alone	1.022	0.866
	(0.165)	(0.138)
Migrated with some hh	0.898	1.024
	(0.170)	(0.188)
Migrated with entire hh	1.274**	1.298**
	(0.126)	(0.127)
Migrated with various hh	1	1
Number of still births		1.117***
		(0.029)
No. of observations	37,957	37,250
No. of subjects	4,348	4,348
Time at risk	37,957	37,250
Clusters	168	168

Note: specification (1) displays the impact of forced displacement on time to a first pregnancy under a Cox proportional hazards model, with coefficients measuring hazard ratios. Specification (2)'s dependent variable is time to higher order pregnancies. Wealth is measured in tropical livestock units. Efron method is adopted to handle ties. Standard errors are in brackets, significance level depending on p-value, *** p<0.01, ** p<0.05, * p<0.1.

Realizing that voluntary migration is a choice that may be endogenous to fertility aspirations, we want to compare the effect (not to be interpreted as a causal effect here, but rather as a correlation) with no displacement, thereby excluding forced displacement. Column 1 in Table 4 presents the results for the first birth. We find a strong and significant positive effect of 77% for voluntary migration. In the case that migration takes place with the entire household, an additional effect of 15% is observed. Education seems to matter statistically, especially secondary education, which reduces the risk of a first pregnancy by about 27%, while the effect of marriage remains the strongest, shortening the length of time to first pregnancy by about 0.3 times. The association with a Muslim faith also remains strong (+28%). Moving to higher order pregnancies in column 2 of Table 4, the effect of voluntary migration on the risk of occurrence of the event amounts to +84%, jointly with the positive effect (+16%) of having migrated with the entire household. This shows that voluntary migration and fertility are particularly correlated for the first child. As before, in the case of higher order pregnancies, the education variables retain their importance, together with the number of children stillborn (+2.7%) and the circumstance of being married.

The magnitude of the effect in Table 4 is higher compared to those obtained for forced displacement in Table 3: when a woman voluntarily migrates, she has a 77% higher likelihood of becoming pregnant (compared to 25% higher likelihood in the case of forced displacement). While this effect runs counter to the expectation we formulated in H2, it is important to note that in Table 4 we do not distinguish between 'moving' and 'in residence'. This distinction will be explored in Table 5. For higher order pregnancies (column 2 in Table 4), we see that the effect of voluntary migration is even more pronounced.

Table 4. Effects of **voluntary migration** on timing of first and higher order pregnancies.

	First conception	Higher order conceptions
	(1)	(2)
Migration (none is control)		
Voluntary migration	1.770***	1.836***
	(0.194)	(0.201)
Age	0.993	1.005
Age^2	1.001	0.999
Education (none is baseline)		
Primary	0.932*	0.908**
	(0.044)	(0.042)
Secondary	0.779**	0.743**
	(0.079)	(0.076)
Religion (Catholic is baseline)		
Protestant	1.067*	1.059*
	(0.053)	(0.053)
Muslim	1.387***	1.382***
	(0.137)	(0.136)
Other	1.114	1.234*
	(0.174)	(0.191)
Wealth (tlu 1993)	0.998	0.997
	(0.003)	(0.003)
Married	1.302**	1.149***
	(0.008)	(0.013)
Company (no migration is baseline)		
Migrated alone	0.926	0.870*
	(0.112)	(0.106)
Migrated with some hh	1.152	1.091
	(0.279)	(0.270)
Migrated with entire hh	1.149	1.160**
	(0.176)	(0.178)
Migrated with numerous hh	1	1
Number of still births		1.150***
		(0.013)
No. of observations	37,470	37,250
No. of subjects	4,389	4,348
Time at risk	37,470	37,250
Clusters	168	168

Note: specification (1) displays the impact of voluntary displacement on time to a first pregnancy under a Cox proportional hazards model, with coefficients measuring hazard ratios. Specification (2)'s dependent variable is time to higher order pregnancies. Wealth is measured in tropical livestock units. Efron method is adopted to handle ties. Standard errors are in brackets, significance level depending on p-value, *** p<0.01, ** p<0.05, * p<0.1.

In Table 5, we distinguish between a year in which a refugee or migrant is in residence in her new site and a year in which she is on the move between residences. We do that for women who were forcibly displaced as well as for women who migrated voluntarily. As our dataset is structured at the woman-year level, we are able to show that distinction per woman and per year. Column 1 presents the results for the first pregnancy. With respect to our second and third hypotheses, we find that *the effect of forced displacement is opposite to that of voluntary migration*: in the year of *moving*, forced displacement increases the probability of a first birth by 37%, whereas in the case of voluntary migration it decreases by 7%. *Residence* in the forced displacement site, on the other hand, increases the risk by 27%, whereas residence in the new voluntary migration site increases it by 113%. Being married has the usual high effect on fertility – increasing the risk of a first conception by a factor of 0.27 if compared to no marriage – and the company of the women during displacement also has an impact on the risk. These results point again at the difference between forced displacement and voluntary migration. In the year of *movement*, the sign of the effect of the two types of migration is opposite. Voluntary migration diminishes the risk of pregnancy (but not significantly compared to no migration). This points to its planned nature, which is often linked to marriage in Burundi, where a woman has at least some control over her fertility and where rape is less likely. Forced displacement on the other hand increases the risk of pregnancy significantly.

In years of *residence* in the new site, the magnitude of the effect (but not the sign) is different: voluntary migration increases the risk of pregnancy more than forced displacement, with both coefficients statistically different from the case of no migration.

Turning to higher order pregnancies, the risk of an additional conception is higher in a year in which the woman is forcibly displaced, as well as in the case of residence in the forced displacement site. Voluntary migration has a similar effect on the time length to the failure event in a subsequent pregnancy as it does for a first pregnancy. The other variables have the usual effect.

Table 5. Effects of **voluntary movement** and **residence** as well as **forced movement** and **residence** on time of first and higher order pregnancies.

	First conception (1)	Higher order conceptions (2)
Migration (none is baseline)		
Forced movement	1.369***	1.436***
	(0.127)	(0.134)
Forced residence	1.277***	1.441***
	(0.093)	(0.105)
Voluntary movement	0.931	0.914
	(0.111)	(0.109)
Voluntary residence	2.134***	2.282***
	(0.185)	(0.198)
Age	1.000	1.006
Age^2	1.000	1.001
Education (none baseline)		
Primary	0.944*	0.904**
	(0.041)	(0.047)
Secondary	0.811**	0.761**
	(0.075)	(0.070)
Religion (Catholic baseline)		
Protestant	1.015	1.003
	(0.047)	(0.046)
Muslim	1.469***	1.429***
	(0.137)	(0.133)
Other	0.930	1.221*
	(0.139)	(0.179)
Wealth (tlu1993)	1.001	0.999
	(0.003)	(0.003)

Married	1.276***	1.286***
	(0.007)	(0.007)
Company (no migration baseline)		
Migrated alone	1.057	0.997
	(0.100)	(0.094)
Migrated with some hh	0.906	0.933
	(0.143)	(0.147)
Migrated with entire hh	1.230**	1.230**
	(0.114)	(0.115)
Migrated with various hh	1	1
Number of still births		1.142***
		(0.011)
No. of obs	40,245	39,400
No. of subjects	4,391	4,391
Time at risk	40,245	39,400
Clusters	168	168

Note: specification (1) displays the impact of voluntary movement and residence as well as forced movement and residence on time to a first pregnancy under a Cox proportional hazards model, with coefficients measuring hazard ratios. Specification (2)'s dependent variable is time to higher order pregnancies. Wealth is measured in tropical livestock units. Efron method is adopted to handle ties. Standard errors are in brackets, significance level depending on p-value, *** p<0.01, ** p<0.05, * p<0.1.

6.3 IDP camps

Lastly, Table 6 considers the effect of having been displaced or having resided in an IDP camp, testing our fourth hypothesis. During the civil war in Burundi, many citizens where forced to reside in IDP camps (the government obliged them), and a minority also resided in these camps for their own safety and for protection from attacks. A forced movement is associated with a 40% shorter time period to first pregnancy (column 1 row 1) and forced residence with a shorter time period of 25%. These increased probabilities of becoming pregnant for the first time are of similar magnitude to those of forced displacement outside of a camp. Turning to voluntary migration to a camp, physical security – or at least the sense of

it – has the effect of raising the risk by 18%, whereas for voluntary residence in camp, the risk of a first conception goes up by 68%. These results are similar to displacement in a non-camp environment, except that moving into an IDP camp on a voluntary basis also increases the risk of pregnancy. Is this because the childbirth facilities are better in camps than in some rural areas, or is this because the movement is unsafe and involves risk of rape, as in the case of forced displacement? With our data, we cannot distinguish between these possibilities, or other explanations for that matter. Multiple causes can be present at the same time.

As for the control variables, secondary education slightly reduces the risk or increases the time period before the event, with Islamic faith still doubling the risk or halving the time to first pregnancy. Wealth has a non-significant effect on such risk, and the results do not change with the inclusion of a site-specific random effect. Lastly, for higher order pregnancies, a forced movement into an IDP camp has the effect of letting the hazard ratio grow by 57%, and a forced residence by 34.6%. Concerning voluntary movement and residence, the former increases the risk by 90%, the latter increases it by 77.7%. Migrating with the whole household increases the risk by about 22% and being married raises such risk by 27%.

Table 6. Effects of forced displacement and residence as well as voluntary migration and residence in an **IDP camp** on time of first and higher order pregnancies.

	First conception (1)	Higher order conceptions (2)
Migration (none is baseline)		
Forced camp movement	1.398***	1.569***
	(0.107)	(0.120)
Forced camp residence	1.250**	1.346***
	(0.112)	(0.121)
Voluntary camp movement	1.183***	1.899***
	(0.188)	(0.196)
Voluntary camp residence	1.680***	1.777***
	(0.163)	(0.171)

Age	1.003	1.006
Age^2	1.000	1.001
Education (none baseline)		
Primary	0.937*	0.896**
	(0.041)	(0.039)
Secondary	0.797**	0.751**
	(0.073)	(0.069)
Religion (Catholic baseline)		
Protestant	1.013	1.011
	(0.047)	(0.046)
Muslim	1.461***	1.421***
	(0.135)	(0.133)
Other	0.934	1.228*
	(0.140)	(0.179)
Wealth (tlu1993)	1.001	0.999
	(0.003)	(0.003)
Married	1.274***	1.284***
	(0.114)	(0.007)
Company (no migration baseline)		
Migrated alone	0.971	0.898*
	(0.093)	(0.086)
Migrated with some hh	0.897	0.925
	(0.141)	(0.146)
Migrated with entire hh	1.221**	1.219**
	(0.114)	(0.114)
Migrated with various hh	1	1
No. still births		1.142***
		(0.011)
No. of obs	40,245	39,400
No. of subjects	4,391	4,391
Time at risk	40,245	39,400
Clusters	168	168

Note: specification (1) displays the impact of voluntary movement and residence as well as forced movement and residence in an IDP camp on time to a first pregnancy under a Cox proportional hazards model, with coefficients expressed as hazard ratios. Specification (2)'s dependent variable is time to higher order pregnancies. Wealth is measured in tropical livestock units. Efron method is adopted to handle ties. Standard errors are in brackets, significance level depending on p-value, *** p<0.01, ** p<0.05, * p<0.1.

7. Conclusions and policy implications

We studied the effect of forced displacement and voluntary migration in conflict–affected Burundi on fertility outcomes within a sample of 4,523 women interviewed in a nationwide survey at the end of the year 2002. The data collected in the survey allowed us to construct a panel of fertility and migration histories at the mother-year level, dating back until the 1970s. We adopted methods of survival analysis to study the relationship between fertility and several stages of migration and displacement. Given the pre-treatment differences between the samples of women who never migrated, those who were forcibly displaced, and those who voluntarily migrated (which signals selection into displacement/migration), we cannot claim causality in our analysis.

We chose semi-parametric survival regression models à la Cox as a suitable functional form to describe and analyze the stochastic process of subsequent births that mothers experienced. In particular, we distinguished a *starting* fertility behavior (age at which a woman first chooses or happens to have a first conception) from a *spacing* behavior (which we define as the average distance, in years, between higher order conceptions). We made an assumption regarding the size of the risk set of the right censored dataset: women enter their fertile period at a fixed age (12) and exit from it at another fixed age (46). It can be argued that such an assumption is simplistic, in that it does not allow for randomness in the beginning of the menarche or in the onset of menopause. We furthermore do not formulate nor apply any framework to the analysis of *stopping* behavior. There exist theoretical models, such as the one proposed in Perrin and Sheps (1964), that formulate state space formulations of human reproduction, and let appropriate empirical specification derive from them. But this is beyond the scope of this empirical investigation.

We adopted both time invariant covariates, such as educational level and religious belief, and time varying ones, such as age of the mother and whether or not she is married in a given year. The focal effect of interest here, derived from the displacement questions in the survey, is the migratory status, which takes different declinations on the hazard of a first or a higher order pregnancy. We study forced displacement as well as voluntary migration (of which the latter is most likely endogenous), and thus emphasize correlation rather than causation. We also distinguish between the year in which the actual displacement took place and the years in which the woman resided in the new site.

For first pregnancies as well as higher order pregnancies, we find that the risk of a pregnancy is higher for forcibly displaced women, both when they are moving between two residencies and when they are in residence. The risk is also higher in case of voluntary migration, but only when women are in the new residence. This suggests that the mechanism driving voluntary migrant fertility is related to separation as well as marriage-induced behavior: the representative woman tends not to become pregnant in the year of voluntary migration, but once settled in her new residence, she exhibits an increased probability of conception.

Presumably, this observation is related to the very nature of forced displacement: it goes hand in hand with insecurity, violence and poverty – factors that are not conducive to maintaining control over one's fertility.

Demographers could play a critical role in helping governments, IOs and NGOs to collect basic data on the fertility and health status of forcibly displaced women and thereby improve protection and assistance for these vulnerable groups.

Our research shows that in times of forced displacement, women have a higher risk of becoming pregnant. The risk is higher compared to non-displacement and much higher

compared to voluntary migration. In the latter case, women (are able to) plan their pregnancy better, resulting in a much higher pregnancy outcome once they reside in the new destination. This means that forcibly displaced women have a much lower level of control over their reproductive behavior.

This is linked to the conditions of their displacement: they can find themselves in a hostile environment, in sudden, unplanned circumstances, with little or no health care, no access to contraception, and potentially exposed to violence, coercion and rape. Agencies and NGOs that strive to reduce the risk of displacement-related pregnancy must therefore create and support measures that assist women to remain in charge of their fertility. This can be achieved through the provision of health services, including reproductive health, to men and women who are on the move – particularly when they are fleeing hostilities.

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Appendix

A. Definition of some relevant variables

These are the meanings of the main categorical variables used along the survival analysis which are related to the various forms of migration as well as to the control variables.

displ_any = 0 if no displacement;

1 if some displacement of any type;

forced_volun = 0 if no displacement;

1 if forced displacement;

2 if voluntary migration;

moving_residing = 0 if no displacement;

1 if forced displacement;

2 if forced residence;

3 if voluntary migration;

4 if voluntary residence;

new_camp = 0 if no displacement in camp;

1 if forced displacement in camp;

2 if voluntary migration in camp;

3 if forced residence in camp;

4 if voluntary residence in camp;

educ = 0 if no education at all;

1 if at least some primary education completed;

2 if at least some secondary education completed;

religion = 1 if Catholic;

2 if Protestant;

3 if Muslim;

4 if other;

company = 0 if no displacement;

1 if migrated or displaced alone;

2 if migrated with some household member;

3 if migrated with all household members;

4 if migrated with numerous other households.

Charts

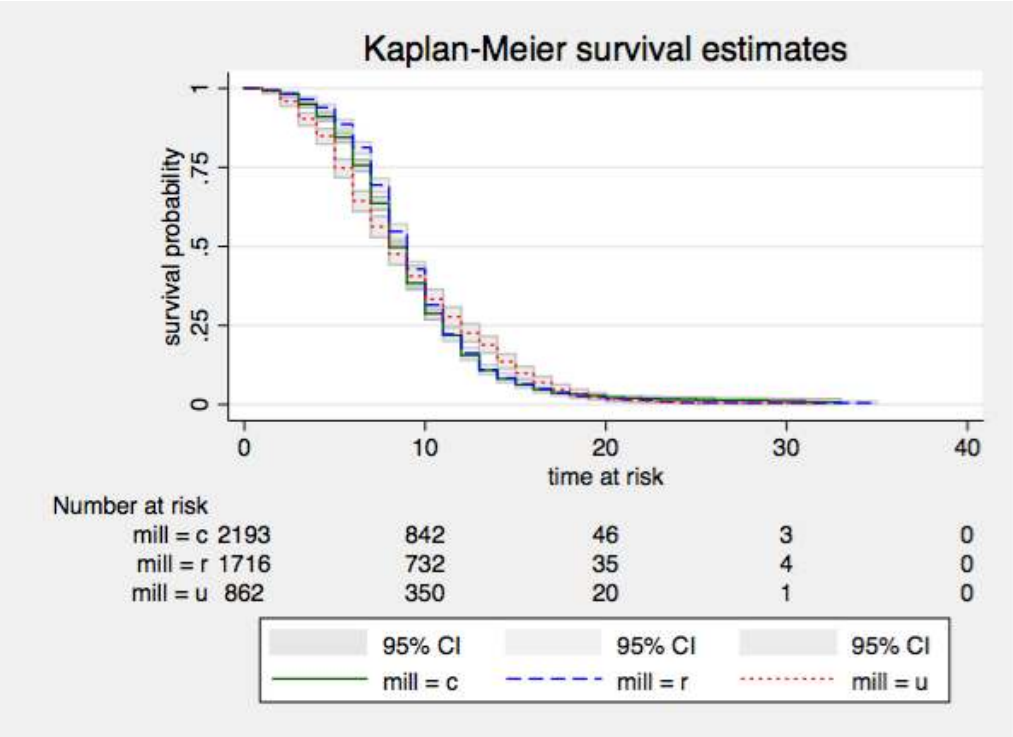

Figure 2.a. Kaplan – Meier survival estimate for first pregnancies with confidence intervals distinguishing by zone types.

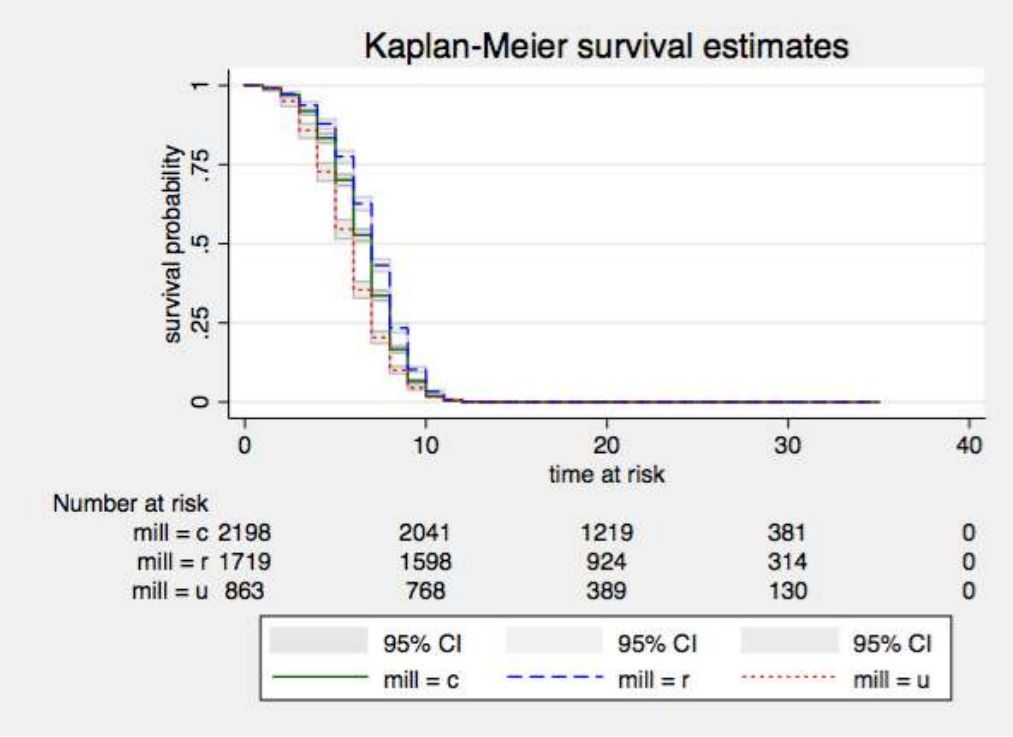

Figure 2.b. Kaplan – Meier survival estimates for higher order conceptions with confidence intervals distinguishing by zone types.

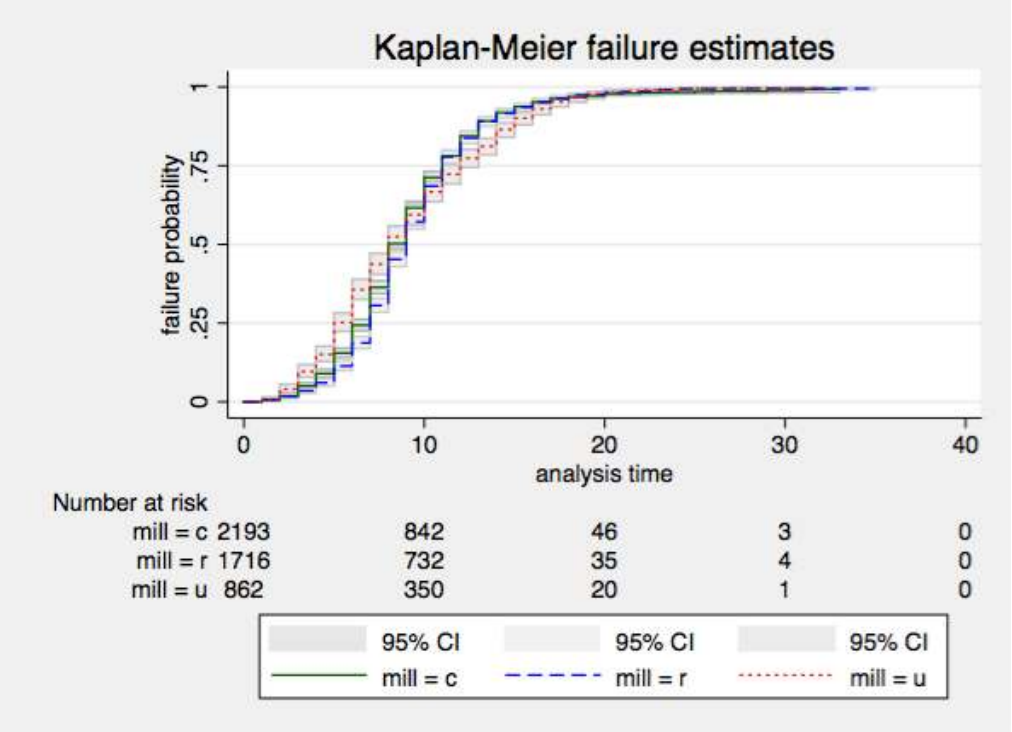

Figure 3.a. Kaplan-Meier failure estimates for first pregnancies with confidence intervals distinguishing by zone types.

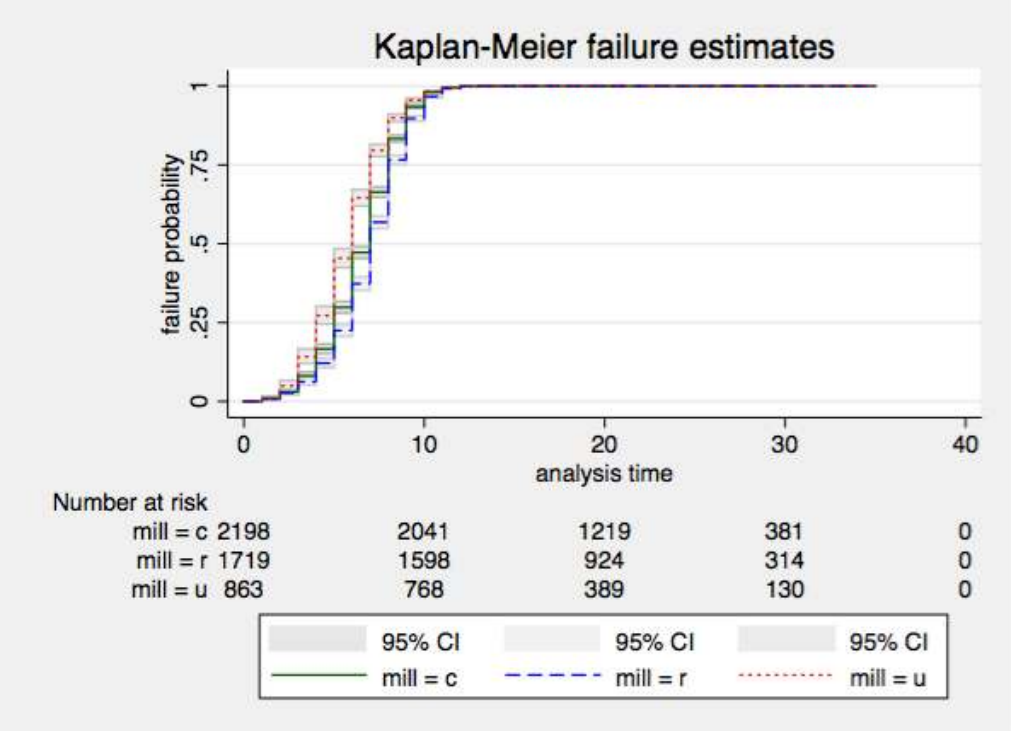

Figure 3.b. Kaplan-Meier failure estimates for higher order pregnancies with confidence intervals distinguishing by zone types.

Notes

[i] As measured in years. The distinction is relevant considering the existence of scholarly contributions such as the study by Knodel (1987), which emphasizes the need to decompose various aspects of fertility, namely *starting*, *spacing* and *stopping*.

[ii] See also Rosenzweig and Wolpin (1980).

[iii] Lower fertility, lower neonatal mortality, lower maternal mortality, and higher birth weight.

[iv] Referred to hereafter as ESDSR (2002).

[v] The overall population inhabiting the country reached the figure of approximately 6.8 million people at the time of the survey.

[vi] We interpret the random - effect as a form of community level heterogeneity, also known as shared frailty, in the survival analysis literature.

[vii] Each woman is assumed to be in the risk set of fecund age whenever she is in between the age of 12 and 46. This is a somewhat stringent assumption in that it does not allow for randomness in the age at menarche (Newman 1983).

[viii] We recall that a continuous, positive random variable X has the Weibull distribution with parameters α>0 and β>0 if and only if has pdf $f(x) = \alpha\beta^{\alpha}x^{\alpha-1}\backslash exp\{-[x/\beta]^{\alpha}\}\, I(x > 0)$ (Mukhopadhyay 2000). By varying the values for α and β, one can generate interesting shapes for the associated probability density function.

[ix] Tropical livestock unit is a convenient measure to quantify a wide range of different livestock types and sized in a standardized manner. Exchange ratios are established with a number of common livestock varieties: 1 TLU = 1.0 camels, 0.7 cattle, 0.1 sheep/goats. Source: \url{http://www.fao.org/Wairdocs/ILRI/x5443E/x5443e04.html}.