The impact of hosting refugees on the intra-household allocation of tasks: A gender perspective

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Abstract
This paper examines whether the presence of refugees alters the intra-household allocation of tasks across genders in the hosting population. Using panel data (pre- and post-refugee inflow) from Kagera, a rural region of Tanzania, we find that the refugee shock led to women being less likely to engage in employment outside the household and more likely to engage in household chores relative to men. This is probably the result of the environmental degradation that accompanied the arrival of refugees and the additional competition for natural resources such as wood and water. However, the results differ by (pre-shock) literacy and math skill. For women who could read and perform simple written mathematical operations the refugee shock resulted in a higher likelihood of engaging in outside employment. In contrast, higher exposure to the refugee shock resulted in illiterate women being more likely to engage in farming and household chores.

1 | INTRODUCTION

This paper examines the impact of refugee inflows on the intra-household allocation of tasks of the hosting population, paying particular attention to the differences of this impact across the genders. While there is a growing interest in estimating the economic impacts of hosting refugees...
(Azevedo, Yang, & Kaan Inan, 2016; Balkan & Tumen, 2016; Del Carpio & Wagner, 2015; Ruiz & Vargas-Silva, 2013, 2015, 2016; Tumen, 2016; among others), we know little about the consequences of refugee inflows on different household members. In addition, the literature on the gender-specific impacts of immigration is focused on high-income countries (Barone & Mocetti, 2011; Cortes & Tessada, 2011; Furtado, 2015). This limits our understanding of the potential consequences of hosting refugees, since, according to the United Nations High Commission for Refugees (UNHCR), over 80 per cent of refugees worldwide are located in neighboring developing countries (UNHCR, 2016).

We use panel survey data from Kagera—a rural region of Tanzania—for the analysis. In the early 1990s, Burundi and Rwanda experienced major conflicts that resulted in hundreds of thousands of casualties (Bundervoet, 2009; Daley, 2008; Kondylis, 2008; Martin & Hiddleston, 2006; Ruiz, Siegel, & Vargas-Silva, 2015). Over one million residents of these two countries sought refuge in Western Tanzania during the 1990s and 2000s, and in some regions refugees outnumbered natives five to one (Whitaker, 2002). Because of its geographic location, Kagera was one of the main destinations of refugees.

The focus on the gender consequences of hosting refugees is important for several reasons. For instance, the arrival of refugees in rural areas often leads to greater demand for resources such as firewood and water, resulting in deforestation of areas close to refugee settlements. In fact, refugees have often been categorized as “resource degraders” (Jacobsen, 1997).1 In rural Tanzania it is common for households to collect firewood for cooking and fetch drinking water on a frequent basis—tasks that are typically the responsibility of women (Leavens & Anderson, 2011). Additional time spent on these tasks can restrict their involvement in income-generating activities (Ellis, Blackden, Cutura, MacCulloch, & Seebens, 2007; Whitaker, 1999). While household members share income to some extent, evidence suggests that those who earn the income have greater bargaining power over spending and resource allocation (Antman, 2014; Attanasio & Lechene, 2002; Bobonis, 2009; Duflo, 2003; Duflo & Udry, 2004). Consequently, more time dedicated to household chores, as a result of the presence of refugees, could affect the control of local women over household spending and other key decisions.

In contrast local women could employ refugees willing to work for low pay to help with household chores (including collecting firewood and fetching water) and dedicate more time to income-generating activities. This would result in greater autonomy of local women and potentially greater control over household spending decisions. Reports suggest that in some areas close to the camps, the wage rate for casual work decreased by 50 per cent after the arrival of the refugees (Whitaker, 2002) and there is evidence that refugees substituted for casual local workers (Ruiz & Vargas-Silva, 2016).

We would also expect the impact of refugees to differ across skill levels. There is a large literature for high-income countries showing that immigration has a different impact across skill groups (Dustmann, Frattini, & Preston, 2013; Giuntella, Mazzonna, Nicodemo, & Vargas-Silva, 2016). Some of these studies have explored this difference in impact from a gender perspective and suggest that low-skilled immigration has a positive impact on the labor supply of higher-skilled women (Cortes & Tessada, 2011). In addition, Amuedo-Dorantes and Sevilla (2014) find that the presence of low-skilled migration has a gender impact with women adjusting their time uses on household activities. A similar dynamic could occur in the case of refugee inflows in a low-income country. Particularly, in this setting, even basic literacy could make a difference. For instance, literate women are less likely to compete with refugees in the labor market and could take advantage of new work opportunities (e.g., administrative work for camps or in international or nongovernmental organizations) and of the cheaper labor supply represented by refugees to help with...
household chores. In fact, Ongpin (2008) reported that there were increased job opportunities for locals at international organizations and NGOs after the arrival of the refugees.

Another known consequence of the refugee shock in Tanzania was an increase in demand for specific agricultural products (Alix-Garcia & Saah, 2009). For example, there are accounts of international agencies increasing the demand for wood and the price of tree farms (Whitaker, 1999). As in much of Africa, although women participate in these activities, Tanzanian men are typically the ones responsible for managing cash-crop farming (Tibaijuka, 1994; Warner & Campbell, 2000). Reports from the region at the time of the shock suggest that this increase in demand for specific agricultural products led male members of the household to dedicate more time to cultivating crops that were traditionally managed by women. These crops were no longer exclusively for household consumption and had become a profitable business (Whitaker, 2002).

Given the particularities of the refugee inflows and the available anecdotal evidence, Kagera is apt for the study of the gendered impacts of refugees on host communities. In addition, a number of exogenous factors affected the location of refugees within Kagera, allowing the use of this refugee inflow as a quasi-natural experiment. First, the overwhelming majority of refugees from Burundi and Rwanda migrated on foot (Fransen, Ruiz, & Vargas-Silva, 2017). Distance from the border was therefore a key factor in determining the number of refugees in each location. Second, the topography of the region is such that there were natural barriers (i.e., a chain of mountains and game reserves) that restricted the access of refugees to the eastern part of Kagera (Baez, 2011). Third, government authorities selected locations for refugee camps that were very close to the borders of Burundi and Rwanda (Maystadt & Verwimp, 2014), in order to minimize costs related to transportation and facilitate future repatriation.

We use the Kagera Health Development Survey (KHDS) for the empirical analysis. The KHDS contains information for the pre-shock (i.e., 1991) and the post-shock (i.e., 2004) periods. Several studies have used the KHDS to explore the effects of this refugee shock on the local population (i.e., Tanzanians). Baez (2011) found that the refugee shock resulted in a worsening of Tanzanian child anthropometrics and an increase in their incidence of infectious diseases. A more positive result is found by Maystadt (2011) and Maystadt and Duranton (2014), whose findings indicate that the refugee inflow improved the welfare of the hosting population by reducing poverty and transport costs as a result of increased road building. Maystadt and Verwimp (2014) found heterogeneous effects of the refugee shock. While the overall welfare impact of the shock was positive, agricultural workers faced more competition from refugees. Likewise, Ruiz and Vargas-Silva (2015, 2016) provide evidence of potential labor market competition between refugees and local workers, particularly for casual work. However, other workers benefited from the presence of refugees. While these papers have provided interesting insights, intra-household differences on the impact of the refugee shock on tasks and time allocation remain to be explored.

Our results suggest that hosting refugees had different impacts on tasks and time allocation for women and men. In general, greater exposure to the refugee shock resulted in women being less likely to engage in outside employment and more likely to engage in water fetching and firewood collection than men. Further examination suggests that the impact of the shock varies across skill levels. Women who can read and perform simple mathematical operations experienced an increase in the likelihood of outside employment as a result of the refugee shock. We would expect these women to be more likely to take advantage of the additional supply of cheap labor represented by refugees to help with household chores. In contrast, the results indicated that higher exposure to the refugee shock resulted in illiterate women being more likely to engage in farming or collecting firewood/fetching water. These results are in line with previous evidence on the impact of immigration on the labor supply of women in high-income countries.
The rest of the paper is organized as follows. The next section presents the historical background of the refugee shock. Section 3 presents the conceptual background. Section 4 presents the data and methodology. The fifth section presents the results. Section 6 concludes.

2 | THE REFUGEE SHOCK

The refugee shock refers to the large inflow of refugees into Kagera, a region located in the West of Tanzania. The majority of refugees originated from Burundi and Rwanda, two small countries in the Great Lakes Region of Africa. Both countries were divided along ethnic lines between Hutus and Tutsis and ethnic tensions rose in the early 1990s, which led to a large-scale conflict in both countries, including what has been internationally condemned as the genocide of the Tutsi minority in Rwanda (Prunier, 1995; Verwimp, 2005).

Figure 1 shows the number of refugees from Burundi and Rwanda in Tanzania over time. It should be noted that there were a considerable number of refugees from Burundi in Tanzania before the events of 1993. This influx was mostly the result of a campaign of violence by the Tutsi-dominated government of Burundi against Hutus in 1972. These refugees were settled in the regions of Tabora and Rukwa, were given land for cultivation, and, by all accounts, became self-sufficient (Thomson, 2009). As shown in Figure 1, the number of Burundian refugees more than doubled after the 1993 events to reach over 500,000. The number of Rwandan refugees jumped even more dramatically from 1994 onwards to reach over 600,000. Overall, the number of Burundian and Rwandan refugees in Tanzania increased from less than 200,000 to over 800,000 in just two years. The refugees from Rwanda returned home after a few years, but those from Burundi, which experienced a lengthier conflict, remained in the country for much longer.

Kagera is located on the western shore of Lake Victoria in Tanzania (Panel A of Figure 2). It borders Uganda to the north and Rwanda and Burundi to the west. Given its geographical location,
Kagera was one of the main destinations of refugees during the 1990s. However, a series of geographical and logistical factors as well as policy decisions led to an uneven spread of refugees across Kagera (see subsection 4.3 for details). As shown in Panel B of Figure 2, the refugee camps were largely concentrated in the western part of Kagera.

The presence of refugees in Tanzania has been strongly linked to environmental degradation. Refugees cut down trees in order to use the wood for shelter and cooking and to clear space for cultivating crops, and this led to the deforestation of areas close to the refugee camps. As explained by Berry (2008, p. 7), the presence of refugees meant that it was necessary to “travel much greater distances to find firewood and wood for construction than was necessary 10 years ago.” Whitaker (1999) also explains that refugees in Tanzania used more firewood per person than the locals. UNHCR (2002) estimates that at the peak of the refugee crisis in Kagera, the camps consumed about 1,200 tonnes of firewood each day and that by 1996 225 km² had been completely deforested and 470 km² partially deforested. UNHCR and other organizations did establish tree-planting programs later on in order to combat deforestation and soil erosion (Renner, 2007). However, any benefits from these programs would take many years to materialize. Therefore, in addition to the short term impacts, the deforestation related to the presence of refugees has long-term environmental consequences, and therefore these consequences span beyond the departure of the refugees from the region.

3 | CONCEPTUAL BACKGROUND

In this section, we present the conceptual framework behind the analysis of the paper. We separate tasks into three groups: household chores, farming, and outside employment. Household chores are required for the household to function properly, but do not earn any income. Farming can be for household consumption, income-generating purposes, or both. Employment outside the household generates income. The presence of refugees will have implications for the demand and supply factors related to these three groups of tasks.

The inflow of refugees to rural regions often increases the total amount of time that is necessary to dedicate to household chores in order for the household to function properly. For example, as explained before, in rural regions it is common for households to fetch water and collect firewood.
on a frequent basis. The presence of refugees leads to additional competition for these resources. In the context that we are exploring (i.e., rural Tanzania) it is common for women to bear the main responsibility for the provision of household services. Consequently, women could be particularly affected by the increase in the time required to fulfill household chores and might need to decrease time dedicated to other activities such as outside employment and farming.

Refugees could also assist with the provision of household services. For instance, a series of studies have looked at the impact of low-skilled immigration on the price of household services in high-income countries (e.g., Cortes, 2008). These studies suggest that low-skilled immigration increases the supply of individuals willing to provide household services and thereby lowers the price of these services. For individuals with high enough productivity outside the household it is optimal to outsource part or all of the household chores and increase the time dedicated to outside employment (Cortes & Tessada, 2011). Similar dynamics could occur in a low-income country when there is an inflow of refugees willing to do household chores for a low price or, in some cases, simply in exchange for food (Whitaker, 2002). In this case, the more productive individuals should respond to the presence of refugees by dedicating more time to outside employment and less time to household chores. Individuals with lower productivity are less likely to take advantage of the presence of the cheap refugee labor supply and would still need to make adjustments for the increase in competition for natural resources represented by the refugees.

The implication of the presence of refugees for farming activities is somewhat more complicated. First, in the context of rural Tanzania, women are typically responsible for crops that are meant for household consumption (food crops), while men are responsible for crops that are intended to generate income (cash crops) (Omari, 1988; Tibaijuka, 1994; Warner & Campbell, 2000). There is substantial evidence that the presence of the refugees led to increased demand for agricultural products (Alix-Garcia & Saah, 2009). Therefore, household members, particularly male members, could dedicate more time to working on cash crops. However, Omari (1988) indicates that, though the appearance of cash crops in Tanzania could lead to greater involvement by men, there is not necessarily a corresponding reduction in the engagement of women, who might just move from producing food crops to working on cash crops. Finally, it was also common to hire refugees to work on crops (Whitaker, 2002). As a consequence, the presence of refugees affects the demand and supply of farming labor.

4 | DATA AND METHODOLOGY

4.1 | The Kagera Health and Development Survey (KHDS)

The KHDS was initially conducted in 51 communities spread across all districts of Kagera. It is a longitudinal dataset in which individuals were tracked over time even if they had moved out of the original community (De Weerdt et al., 2012). After the initial round of the survey, which started in 1991 and ended in 1993, there were five follow-up rounds: three between 1992 and 1994, one in 2004, and one in 2010. In this paper we use the 1991–1993 (i.e., before the arrival of the refugees) and 2004 (i.e., after the arrival of the refugees) rounds of the survey. We cannot use the 2010 round, as some of the key questions for our study were not included in that round. Over 90 per cent of the original households were re-interviewed in the 2004 round of the survey.

The timing of the data collection for this dataset is particularly appropriate for our analysis. The first round of the survey was conducted between September 1991 and May 1993. The conflict in Burundi started in October 1993 and the conflict in Rwanda started in 1994. Therefore, the first round of the survey precedes the start of the conflict.
4.2 | Estimations

The KHDS field team collected the GPS coordinates of the communities during the first round of the survey. Maystadt (2004) used this information, together with the GPS coordinates of the refugee camps from UNHCR, to create distance measures (spherical) from the 51 communities in the first round of the survey to the 13 refugee camps. In total there are 663 pairs of distance measures (51 communities × 13 camps). As shown in Figure 3, there is substantial variation in distance from the host locations to the refugee camps. Some communities were close to camps, while others were farther away.

We use the information on distances to refugee camps to create a variable that proxies the refugee shock ($S_j$) experienced by each household $j$. $S_j$ is the sum of the refugee population weighted by a distance function. That is:

$$S_j = \log \left( \sum_{r=1}^{13} \frac{P_r}{D_{j,r}} \right), \quad (1)$$

where $D_{j,r}$ is the 1991–1993 (i.e., pre-shock) distance from the community of residence to a refugee camp $r$ and $P_r$ is the population of each camp. As explained above, refugees from Rwanda, which accounted for a substantial portion for refugees in Kagera, went back after a few years and were not present in the region by 2004. However, some of the main mechanisms by which we expect refugees to affect the host population (e.g., environmental degradation) are long-term effects and do not depend on the constant presence of refugees in the region (i.e., impact remains relevant after the refugees have returned home).

**FIGURE 3** Pairwise distances between communities and refugee camps

*Note.* The top value of the range is not inclusive. For example, 0–10 means zero or more kilometres, but less than 10.

[Colour figure can be viewed at wileyonlinelibrary.com]

*Source.* Data obtained from Maystadt (2004).
This specification allows households closer to the most populated camps to have a higher value than other households. Different versions of this refugee shock have been used in other papers (e.g., Baez, 2011; Maystadt, 2011; Maystadt & Duranton, 2014; Maystadt & Verwimp, 2014; Ruiz & Vargas-Silva, 2015, 2016). As shown in Figure 4, there is a substantial range of values for the shock variable.

We focus on the impact of the refugee shock on three different groups of tasks: farming, outside employment, and household chores (specifically fetching water and collecting firewood). Farming is the time dedicated to working on crops in household plots (i.e., shambas) and caring for household animals. One limitation of the data is that we cannot distinguish between time dedicated to farming activities for household consumption and for income-generating purposes. Outside employment refers to work outside the household as an employee or self-employed person.

As shown in Table 1, during the pre-shock period the difference between women and men in engagement in firewood/water collection was just 4 percentage points. Close to 70 per cent of individuals were engaged in these tasks, a share that is consistent for households that experienced an above- and below-the-median (future) refugee shock. In addition, there was an 11 percentage point gap between males and females in the share engaged in outside employment. However, the pattern is somewhat different for the post-shock period. The gap in outside employment between men and women increased to 27 percentage points. The increase was particularly large for those who experienced a below-the-median refugee shock. Likewise, the gap in firewood/water collection between women and men increased to 15 percentage points—an increase that was largely driven by those who experienced an above-average refugee shock.

Table 2 reports on the number of hours in the previous week spent on the different tasks. The numbers in brackets are the time spent on the activity if we exclude those who do not participate in the activity (i.e., exclude zeros). Consistent with Table 1, in the pre-shock period women and...
men dedicate about the same amount of time to farming (12–14 hours per week) and fetching water/collecting firewood (5 hours per week), but men dedicate more time to outside employment than women (a difference of 4 hours per week). However, the average time dedicated to different tasks did not change dramatically in the post-shock period. The main change was an increase to 13 hours in the difference between men and women in time dedicated to outside employment.8

The main estimations are a series of regressions along the following lines:

\[ H_{ijt} = \beta_1 l_{ijt} + \beta_2 b_{ijt} + \beta_3 r_{ijt} + \beta_4 u_{ijt} + \beta_5 \tau_t + \beta_6 m_{ijt} + \beta_7 f_i + \beta_8 (\tau_t \times S_{jt}) + \beta_9 (f_i \times \tau_t \times S_{jt}) + \beta_{10} x_{ijt} + \varepsilon_{ijt} \]  

(2)

where \( H_{ijt} \) is either a dummy indicating that individual \( i \) from household \( j \) engaged in a given task during the previous week or the number of hours the individual dedicated to the task during the

| Activity               | 1991 (pre-shock) | 2004 (post-shock) |
|------------------------|------------------|-------------------|
|                        | Women | Men | Difference (t-stat) | Women | Men | Difference (t-stat) |
| All                    |       |     |                     |       |     |                     |
| Farming                | 0.72  | 0.66| 0.07*** (3.63)      | 0.66  | 0.57| 0.10*** (5.11)      |
| Outside employment     | 0.08  | 0.19| −0.11*** (−8.51)   | 0.24  | 0.51| −0.27*** (−15.30)  |
| Firewood and water     | 0.71  | 0.68| 0.04** (2.10)      | 0.60  | 0.45| −0.15*** (7.82)    |
| Observations           | 1,418 | 1,257|                     | 1,418 | 1,257|                     |
| Below-median shock     |       |     |                     |       |     |                     |
| Farming                | 0.70  | 0.62| 0.08*** (3.16)      | 0.62  | 0.50| 0.12*** (4.23)      |
| Outside employment     | 0.07  | 0.22| −0.15*** (−8.07)   | 0.25  | 0.60| −0.35*** (−13.52)  |
| Firewood and water     | 0.68  | 0.67| 0.00 (0.01)        | 0.56  | 0.46| 0.10*** (3.51)     |
| Observations           | 685   | 629 |                     | 685   | 629 |                     |
| Above-median shock     |       |     |                     |       |     |                     |
| Farming                | 0.74  | 0.70| 0.05* (1.89)        | 0.71  | 0.63| 0.07*** (2.87)      |
| Outside employment     | 0.09  | 0.16| −0.07*** (−3.84)   | 0.23  | 0.43| 0.20*** (−8.15)    |
| Firewood and water     | 0.75  | 0.68| 0.07*** (2.95)      | 0.63  | 0.43| 0.20*** (7.53)     |
| Observations           | 733   | 628 |                     | 733   | 628 |                     |

Note: The categories are not mutually exclusive. “Outside employment” is work outside the household as an employee or self-employed person. “Firewood and water” is collection of firewood or fetching water.

Source. Authors’ calculations.
previous week; $\mu_j$ is the household fixed effect; $b_{jt}$, $r_{jt}$, $u_{jt}$ are controls for distance to the borders of Burundi, Rwanda, and Uganda; $\tau_t$ is a time dummy ($2004 = 1$); $m_{ijt}$ controls for the month of the interview in order to capture seasonal effects; $f_i$ indicates that the person is a woman; $S_j$ is the indicator of the refugee shock as presented in (1); $X_{ijt}$ are a series of individual and household controls; and $\varepsilon_{ijt}$ is the error term. The $\beta$’s and $\theta$’s are the estimated coefficients. The main coefficient of interest is $\beta_9$, which represents the relative gender impact of the shock. The tables with the main results (see Sections 5 and 6) also report the estimated values for $\beta_7$ and $\beta_8$. In the estimations the errors are clustered at the village level.

The individual variables included in $X_{ijt}$ are a quartic on age, a dummy for marital status, and a dummy indicating that the individual is literate. At the household level the analysis controls for household size, ratio of children to adults, having a female head, and having a married head. Table 3 provides descriptive statistics on these control variables. Women are slightly older and, as found in other papers on Tanzania, less likely to be literate (i.e., able to read a newspaper). See Appendix Section A1 for a full description of the construction of all the variables included in the estimation.

As explained above, there is a literature that suggests that the impact of immigration on women differs across skill levels. In order to explore this aspect further, we present separate estimations by gender and skill level. Kagera is a rural region with low educational levels, but literacy can have major implications for work opportunities outside the household. The overall estimated literacy rate in Kagera for those 15 and older in the 2002 Census was 67.2 per cent, but this number was only 60.5 per cent for females (Population and Housing Census, 2015). The analysis below

| Time spent on | 1991 (pre-shock) | 2004 (post-shock) |
|---------------|-----------------|-------------------|
|               | Women           | Men               | Women           | Men               |
| All           |                 |                   |                 |                   |
| Farming       | 13.7 [18.9]     | 12.2 [18.5]       | 14.0 [21.1]     | 12.1 [21.3]       |
| Outside employment | 1.7 [21.0] | 5.9 [31.1]       | 7.0 [29.4]      | 20.3 [39.7]       |
| Firewood and water | 4.7 [6.5]  | 5.1 [7.5]        | 3.9 [6.5]       | 2.6 [5.8]         |
| Observations  | 1,418           | 1,257             | 1,418           | 1,257             |

**Below-median shock**

| Time spent on | 1991 (pre-shock) | 2004 (post-shock) |
|---------------|-----------------|-------------------|
|               | Women           | Men               | Women           | Men               |
| Farming       | 12.9 [18.3]     | 10.3 [16.6]       | 12.7 [20.6]     | 9.3 [18.5]        |
| Outside employment | 1.8 [26.1] | 7.7 [34.8]       | 8.2 [32.7]      | 24.9 [42.0]       |
| Firewood and water | 4.2 [6.2]  | 5.5 [8.1]        | 3.5 [6.2]       | 2.5 [5.5]         |
| Observations  | 685             | 629               | 685             | 629               |

**Above-median shock**

| Time spent on | 1991 (pre-shock) | 2004 (post-shock) |
|---------------|-----------------|-------------------|
|               | Women           | Men               | Women           | Men               |
| Farming       | 14.5 [19.5]     | 14.1 [20.2]       | 15.2 [21.5]     | 14.9 [23.5]       |
| Outside employment | 1.5 [17.1] | 4.0 [25.8]       | 5.9 [26.0]      | 15.6 [36.5]       |
| Firewood and water | 5.1 [6.8]  | 4.7 [6.9]        | 4.3 [6.8]       | 2.7 [6.1]         |
| Observations  | 733             | 628               | 733             | 628               |

**Note:** The categories are not mutually exclusive. “Outside employment” is work outside the household as an employee or self-employed person. “Firewood and water” is collection of firewood or fetching water. The numbers in brackets are the time spent on the activity if we exclude those who do not participate in the activity (i.e., exclude zero values).

**Source:** Authors’ calculations.
also presents separate estimations for literate and illiterate men and women and for those with and without basic math skill. The literacy indicators refer to the ability to read while math skill is measured as the ability to perform simple mathematical operations (e.g., addition) (self-assessment); both are based on the information provided on the first round of the survey (i.e., pre-shock).

We also expect that younger individuals, who are more flexible in the labor market, would be more likely to make adjustments for the presence of refugees than older ones. For instance, the literature on the labor market impacts of immigration in high-income countries suggests that younger native workers are the ones more likely to compete with migrants for jobs (Angrist & Kugler, 2003). A similar dynamic could exist in the case of refugee inflows in low-income countries. The median age in our sample is 30 years (in 2004). In order to explore differences across age groups we also present separate estimations for those who are 30 years of age or below in 2004 and those who are above this age. It should be kept in mind that the information on activities and time use is available only for those who are 7 years of age or older in the 1991–1993 round (at least 18 years of age in 2004).

Also, in order to explore whether the presence of refugees had an impact on the outcomes of the younger cohort, we also look at the tasks and time use of children in the 2004 round of the survey. Many of these children were not born at the time of the first round of the survey, but the presence of refugees could have increased the need for their involvement in household chores.

We include all individuals in the main estimations and then exclude those who migrated out of Kagera by 2004 in the robustness section. The inclusion/exclusion of these individuals does not affect the results. Moreover, the bias that results from including emigrants in the sample (including those who moved within the Kagera region) is against the finding of significance as some of those assigned a large shock could potentially have been affected to a lesser degree owing to emigration.

| Variable          | 1991 Women | 1991 Men | Difference (t-stat) | 2004 Women | 2004 Men | Difference (t-stat) |
|-------------------|-----------|---------|---------------------|-----------|---------|---------------------|
| Age               | 26.4      | 23.6    | 2.74***             | 38.9      | 36.4    | 2.49***             |
|                   |           |         | (4.20)              |           |         | (3.77)              |
| Literate          | 0.6       | 0.7     | −0.10***            | 0.7       | 0.9     | −0.15***            |
|                   |           |         | (−5.32)             |           |         | (−9.36)             |
| Married           | 0.3       | 0.3     | 0.04**              | 0.6       | 0.7     | −0.07***            |
|                   |           |         | (2.13)              |           |         | (−3.77)             |
| Household size    | 7.7       | 7.5     | 0.29**              | 5.4       | 4.9     | 0.48***             |
|                   |           |         | (2.02)              |           |         | (4.36)              |
| Female head       | 0.2       | 0.2     | 0.06***             | 0.3       | 0.1     | 0.23***             |
|                   |           |         | (3.72)              |           |         | (14.85)             |
| Married head      | 0.7       | 0.7     | −0.03               | 0.7       | 0.7     | −0.09***            |
|                   |           |         | (−1.43)             |           |         | (−4.80)             |
| Child to adult ratio | 0.2   | 0.2     | 0.02***             | 0.2       | 0.2     | 0.03***             |
|                   |           |         | (3.57)              |           |         | (4.20)              |

| Observations      | 1,418     | 1,257   |                     | 1,430     | 1,257   |                     |

Source. Authors’ calculations.
4.3 Exogeneity of refugee camp locations

Our identification strategy relies on the idea that the location of refugee camps in Kagera was exogenously determined. As we argue below, and as explained in other papers in the literature, topography, the sudden nature of the inflow, and policy considerations were the major drivers of camp location (Baez, 2011; Maystadt, 2011; Maystadt & Duranton, 2014; Maystadt & Verwimp, 2014; Ruiz & Vargas-Silva, 2015, 2016).

First, the overwhelming majority of refugees from Burundi and Rwanda traveled on foot (Fransen et al., 2017; Ruiz & Vargas-Silva, 2016). Distance from the border was therefore a key factor in determining the original number of refugees in each location.

Second, a series of natural topographic barriers limited the access of refugees to the eastern part of Kagera. As shown in Panel A of Figure 5, a chain of mountains separates the eastern and western parts of Kagera. Furthermore, there are several game reserves that separate the southern and northern part of Kagera and further limit movement across these regions (see Panel B of Figure 5).

Third, the increase in the number of refugees was very sudden. For instance, more than 200,000 Rwandans crossed into Tanzania during a 24-hour period in what was described at the time as “the fastest and largest exodus of refugees in modern times” (Wilkinson, 1997). The scale and suddenness of the refugee inflow made it impossible for the Government of Tanzania to strategically direct the refugees to specific regions of the country (Baez, 2011).

FIGURE 5 Topographic and protected areas maps of Kagera
Note. The dark blue-green areas superimposed on the Panel B map are protected areas, in most cases game reserves. [Colour figure can be viewed at wileyonlinelibrary.com]
Source. Information on the location of protected areas from World Database on Protected Areas (WDPA).
Fourth, contrary to other situations of displacement, in this case the large majority of refugees were hosted in camps. Based on costs and logistical considerations, UNHCR and the Government of Tanzania located the refugee camps close to the borders of Burundi and Rwanda (Maystadt & Verwimp, 2014). Transporting refugees to other areas in Tanzania would have required a major financial investment, and repatriation was considered to be easier from locations closer to the border.

In order to check that the refugee shock variable is not capturing pre-shock differences between communities in variables related to activities, we estimated regressions between the 1991 to 1993 activities of the individuals and the refugee shock measure. As shown in Table 4, there is no significant relationship between the variables.\(^{10}\)

5 | RESULTS

5.1 | Baseline results

Table 5 reports the baseline results. Looking at column (4), which includes all controls and the fixed effects, it seems that greater exposure to the presence of refugees led to a higher probability of engaging in farming but had no impact on the likelihood of engaging in outside employment or collecting firewood/fetching water. Also, women are more likely to engage in farming and collecting firewood/fetching water, but less likely to engage in outside employment.

Turning to the main coefficient of interest, the results suggest that once we control for relevant factors, the refugee shock had gender-specific impacts. In particular, more exposure to the presence of refugees led to women being less likely to engage in outside employment than men (column 4). In contrast, the refugee shock led to women being more likely to engage in fetching water and collecting firewood and to engage in farming than men. Estimates using the median value of the shock suggest that the presence of refugees leads to women being close to 9 percentage points more likely to engage in farming and fetching water/collectiong firewood and 18 percentage points less likely to engage in outside employment than men.

Table 6 presents the results for the time allocated to each task. The results using fixed effects and the controls (columns 3 and 4) suggest that greater exposure to the refugee shock reduced the

| TABLE 4 Impact of refugee shock on likelihood of engaging and time spent on a task using 1991–1993 (i.e., pre-shock) data |
|-------------------|------------------|-------------------|-------------------|
| Independent variable | Farming | Outside employment | Firewood and water |
| Likelihood of engaging | | | |
| Refugee shock | 0.07 | -0.15 | -0.05 |
| (0.54) | (-1.16) | (-0.26) |
| Time spent on task | | | |
| Refugee shock | 2.80 | -6.15 | 0.54 |
| (0.85) | (-0.96) | (0.37) |
| Controls | X | X | X |
| Observations | 2,625 | 2,625 | 2,625 |

Note: The categories are not mutually exclusive. “Outside employment” is work outside the household as an employee or self-employed person. “Firewood and water” is collection of firewood or fetching water. The regressions control for the variables included in Table 4 and dummies for district within Kagera.

Source. Authors’ calculations.
time allocated to outside employment by women relative to men. The results also suggest that the refugee shock led to women dedicating more time to fetching water and collecting firewood than men. In columns (5) and (6) of Table 6 we present results from a Tobit estimation in order to address the large number of zeroes in our dependent variable. The coefficients for farming and for fetching water and collecting firewood are still positive and significant. In contrast, the coefficient for outside employment is insignificant, suggesting that the effect could be driven by the likelihood of participation in the activity. However, it should also be kept in mind that the Tobit estimation does not include household fixed effects.

### 5.2 Results for different literacy and math skill levels

Table 7 reports the results for the likelihood of engaging in different activities and time dedicated to those activities by gender, literacy, and math skill. The results are different for the
skilled and unskilled, particularly for women. The refugee shock had a significant positive effect on the likelihood of outside employment for women who could read and perform simple mathematical operations, but had no impact on the likelihood of farming or collecting firewood-fetching water. The result is in the opposite direction for other women. For instance, the shock resulted in illiterate women being more likely to engage in farming and collection of firewood-fetching water. Thus, there is evidence that the shock had different effects on women and potentially benefited those who were more likely to take advantage of the additional supply of cheap labor represented by refugees. We do not find much evidence of an impact on time dedicated to different activities.¹¹

### TABLE 6 Impact of refugee shock on time allocation: Women vs men

| Dependent variable: time spent on | (1) | (2) | (3) | (4) | (5) | (6) |
|-----------------------------------|-----|-----|-----|-----|-----|-----|
| **Farming**                       |     |     |     |     |     |     |
| Refugee shock                     | 3.15** | 2.93** | 1.49 | 0.77 | 4.38** | 4.02** |
|                                   | (2.11) | (2.07) | (0.60) | (0.29) | (2.26) | (2.19) |
| Female                            | 1.57*** | 0.54 | 1.38*** | −10.78 | 2.60*** | 1.10 |
|                                   | (2.77) | (0.96) | (2.64) | (−0.41) | (3.34) | (1.37) |
| Refugee shock × Female            | 0.06 | 0.17* | 0.06 | 0.16* | 0.15 | 0.31** |
|                                   | (0.65) | (1.95) | (0.70) | (1.86) | (1.19) | (2.49) |
| **Outside employment**            |     |     |     |     |     |     |
| Refugee shock                     | −0.98 | −2.47 | 1.27 | 1.51 | −9.42 | −8.33 |
|                                   | (−0.89) | (−1.26) | (0.68) | (0.86) | (−1.13) | (−1.11) |
| Female                            | −4.42*** | −4.60*** | −3.98*** | −4.64*** | −27.09*** | −29.91*** |
|                                   | (−6.93) | (−6.89) | (−5.90) | (−6.39) | (−7.06) | (−7.27) |
| Refugee shock × Female            | −0.98*** | −0.89*** | −1.00*** | −0.91*** | −0.98** | −0.27 |
|                                   | (−8.99) | (−8.73) | (−9.21) | (−8.76) | (−2.32) | (−0.61) |
| **Firewood and water**            |     |     |     |     |     |     |
| Refugee shock                     | 0.37 | 0.03 | −0.68 | −0.40 | 0.55 | −0.23 |
|                                   | (0.65) | (0.05) | (−1.03) | (−0.57) | (0.60) | (−0.26) |
| Female                            | −0.45 | −0.23 | −0.34 | −0.09 | −0.31 | 0.09 |
|                                   | (−1.02) | (−0.54) | (−0.71) | (−0.19) | (−0.49) | (0.15) |
| Refugee shock × Female            | 0.20*** | 0.20*** | 0.20*** | 0.20*** | 0.33*** | 0.35*** |
|                                   | (4.45) | (4.75) | (4.57) | (4.88) | (5.11) | (5.61) |
| Controls                          | X   | X   |     |     |     |     |
| Tobit                             | X   | X   |     |     |     |     |
| Household fixed effects           | X   | X   |     |     |     |     |
| Observations                      | 5,350 | 5,350 | 5,350 | 5,350 | 5,350 | 5,350 |

*Note:* The categories are not mutually exclusive. “Outside employment” is work outside the household as an employee or self-employed person. “Firewood and water” is collection of firewood or fetching water. Tobit estimates (i.e., columns 5 and 6) are marginal effects.
5.3 | Results for different age cohorts

5.3.1 | Below and above 30 years of age

Table 8 reports the results on the likelihood of engaging in different activities when the sample is split between those who are 30 years of age or younger and those who are above 30 years of age in 2004. As explained above, we expect that younger individuals will be more likely to adjust their behavior in response to the refugee shock.

The results are substantially different across the age cohorts. First, the results for the full sample seem to be driven by those 30 years of age or younger. For this group the refugee shock results in women being less likely to engage in outside employment and more likely to engage in farming...
and fetching water/collecting firewood than men. In contrast, for those over 30 the refugee shock does not have much of a gender-specific effect. Table 8 also reports on the gender impact of the refugee shock on time allocation when the sample is split by age cohort. Again, for this variable the results are driven by those in the 30 years of age or less group.\textsuperscript{12}

### 5.3.2 Children

Child labor is common in Tanzania (Beegle, Dehejia, & Gatti, 2006; Bureau of International Labor Affairs, 2015; Kondylis & Manacorda, 2012) and activities such as fetching water and collecting firewood are typically associated with it (Ellis et al., 2007). In this section we explore the impact of the shock experienced by the household on the activities of those who were children (7–14

| Dependent variable engaged on | 30 or less in 2004 | Over 30 in 2004 |
|-------------------------------|-------------------|-----------------|
|                               | Likelihood of engaging | Time spent on task | Likelihood of engaging | Time spent on task |
| Farming                       |                    |                  |                    |                  |
| Refugee shock                 | 0.03 (0.34)        | 1.48 (0.42)      | −0.00 (−0.04)      | −0.71 (−0.30)    |
| Female                        | 0.01 (0.34)        | −0.39 (−0.58)    | 0.08*** (2.85)     | 2.17*** (2.57)   |
| Refugee shock × Female        | 0.01* (1.71)       | 0.25** (2.47)    | 0.01 (1.21)        | 0.05 (0.40)      |

| Outside employment            |                    |                  |                    |                  |
| Refugee shock                 | −0.04 (−0.86)      | −0.83 (−0.38)    | 0.18* (1.95)       | 5.55* (1.82)     |
| Female                        | −0.01 (−0.39)      | 0.26 (0.34)      | −0.25*** (−6.78)   | −9.25*** (−6.83) |
| Refugee shock × Female        | −0.03*** (−8.64)   | −1.61*** (−8.79) | 0.01 (1.35)        | −0.04 (−0.25)    |

| Firewood and water            |                    |                  |                    |                  |
| Refugee shock                 | −0.11 (−1.42)      | −0.36 (−0.34)    | 0.05 (0.90)        | −0.63 (−0.88)    |
| Female                        | 0.04 (1.14)        | −0.85* (−1.73)   | 0.12** (2.55)      | 1.14** (2.36)    |
| Refugee shock × Female        | 0.24*** (6.03)     | 0.33*** (5.98)   | 0.01 (1.53)        | 0.06 (1.44)      |

| Controls                      | X                  | X                | X                  | X                |
| Household fixed effects       | X                  | X                | X                  | X                |
| Observations                  | 2,680              | 2,680            | 2,670              | 2,670            |

Note: The categories are not mutually exclusive. “Outside employment” is work outside the household as an employee or self-employed person. “Firewood and water” is collection of firewood or fetching water.

Source. Authors’ calculations.
years of age) when the data was collected in 2004. It should be kept in mind that most of these children were not yet born at the time of the first round of the survey. Therefore, we have only cross-sectional data for 2004.

Table 9 shows that higher household exposure to the refugee shock is associated with girls dedicating additional time to outside employment and collecting firewood/fetching water relative to boys. This suggests that hosting refugees could have an impact on girls by raising their participation in household chores and might lead to worse future outcomes. Table 9 also shows the impact of the shock on the schooling activities of children, including the likelihood of attending school and time spent on schooling. The refugee shock has no impact on school attendance, which suggests that the increase in time dedicated to other activities does not come at the expense of schooling.

6 | ROBUSTNESS

In this section we explore the robustness of the results to changes in the sample used. First, we exclude the residents of the Ngara district from the sample. As shown in Figure 1, the refugees from Rwanda returned home after a few years, while those from Burundi stayed in Tanzania for much longer. The majority of Burundian refugees in Kagera where hosted in Ngara, which means that residents of this region experienced a much “extended” shock compared with those in other regions. As shown in columns (1) and (4) of Table 10, there are no significant changes in the results if we exclude Ngara residents from the estimations.

Next we exclude residents of Bukoba Urban from the sample. While Kagera is a predominantly rural region, Bukoba Urban (which includes the regional capital) has a much higher population density than the other districts and, consequently, different labor market dynamics. As shown in columns (2) and (5) of Table 10, the results are also robust to this exclusion from the sample.

Finally, columns (3) and (6) of Table 10 present the results if we exclude from the sample those households that moved out of Kagera between the two rounds of the survey. The results are robust to the exclusion of these emigrants. Thus, results are not driven by a particular likelihood to emigrate among households more (or less) affected by the refugee shock.

7 | CONCLUSION

With more than 65 million forcibly displaced people around the world, there has been a growing interest in understanding the economic implications of hosting refugees. However, there is still very little understanding of the different factors and channels that determine the implications of refugee inflows for different members of the household and there is limited quantitative evidence on the gender implications. This paper examines the impact of hosting refugees on the intra-household allocation of tasks with a gender focus. It looks at a case in which the host community faced a large inflow of refugees (i.e., a refugee shock) and pays particular attention to how this shock altered the distribution and relative intensity of tasks across household members.

Using data from a panel survey from Tanzania for the pre-shock and the post-shock periods, we find that hosting refugees had different impacts on time allocation and activity choice for women and men. In particular, the presence of refugees resulted in women being less likely to engage in outside employment and more likely to engage in household chores (i.e., water fetching
and firewood collection) relative to men. This is likely owing to the additional competition for natural resources represented by refugees and the need to walk further in order to find firewood and water. However, the results differ by literacy level, literate women being more likely to engage in outside employment in response to the shock and illiterate women being more likely to engage in

Table 9: Impact of refugee shock on the likelihood of engaging and time dedicated to tasks for those who were children (7–14 years old) at the time of the shock

| Dependent variable | Likelihood of engaging | Time spent on |
|--------------------|------------------------|---------------|
|                    | (1)        | (2)        | (3)       | (4)       |
| Farming            |            |            |            |            |
| Refugee shock      | 0.12       | 0.09       | 3.37      | 3.36      |
|                    | (0.66)     | (0.49)     | (1.09)    | (0.94)    |
| Female             | −0.64      | −0.56      | 6.56      | 9.63      |
|                    | (−0.86)    | (−0.73)    | (0.42)    | (0.48)    |
| Refugee shock×Female | 0.07      | 0.06       | −0.94     | −1.26     |
|                    | (0.84)     | (0.71)     | (−0.53)   | (−0.55)   |
| Outside employment |            |            |            |            |
| Refugee shock      | 0.01       | −0.00      | 0.34      | 0.02      |
|                    | (0.20)     | (−0.04)    | (0.45)    | (0.04)    |
| Female             | −0.25      | −0.25      | −7.39**   | −10.73*   |
|                    | (−1.51)    | (−1.24)    | (−2.11)   | (−1.89)   |
| Refugee shock×Female | 0.03      | 0.03       | 0.73**    | 1.11*     |
|                    | (1.46)     | (1.17)     | (2.08)    | (1.86)    |
| Firewood and water |            |            |            |            |
| Refugee shock      | 0.06       | 0.04       | −1.53     | −2.06     |
|                    | (1.00)     | (0.59)     | (−0.95)   | (−1.59)   |
| Female             | 0.54       | 0.59       | −24.50**  | −28.84*** |
|                    | (1.12)     | (1.13)     | (−2.27)   | (−2.91)   |
| Refugee shock×Female | −0.06     | −0.06      | 2.74**    | 3.23***   |
|                    | (−1.11)    | (−1.11)    | (2.26)    | (2.91)    |
| Schooling          |            |            |            |            |
| Refugee shock      | 0.05       | 0.09       | −2.43     | −1.63     |
|                    | (0.68)     | (0.83)     | (−0.61)   | (−0.28)   |
| Female             | 0.59       | 0.55       | 14.54     | 3.89      |
|                    | (1.51)     | (1.17)     | (0.78)    | (0.14)    |
| Refugee shock×Female | −0.06     | −0.06      | −1.59     | −0.48     |
|                    | (−1.51)    | (−1.15)    | (−0.79)   | (−0.16)   |
| Controls           | X          |            | X         | X         |
| Observations       | 312        | 312        | 312       | 312       |

Note: The categories are not mutually exclusive. “Outside employment” is work outside the household as an employee or self-employed person. “Firewood and water” is collection of firewood or fetching water.

Source: Authors’ calculations.
farming and collecting firewood/fetching water. This coincides with previous evidence from high-income countries, which suggests that the impact of immigration on women differs according to skill level. However, there is scarce evidence on this type of adjustment by native women in the context of a low-income host country.

Overall, our results suggest that the consequences of hosting refugees are not gender-neutral. Future efforts and programs led by hosting countries and international donors should take this into account.

| TABLE 10 | Impact of refugee shock on likelihood of engaging in task: robustness checks |
|---|---|---|---|---|---|
| Independent variable | Likelihood of engaging | Time spent on |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| **Farming** | | | | | | |
| Refugee shock | 0.25 | 0.02 | 0.02 | 16.68 | 0.48 | 0.10 |
| | (0.87) | (0.23) | (0.24) | (1.60) | (0.17) | (0.04) |
| Female | 0.04* | 0.02 | 0.03 | 0.23 | 0.03 | 0.22 |
| | (1.82) | (0.88) | (1.45) | (0.41) | (0.06) | (0.36) |
| Refugee shock×Female | 0.01* | 0.01** | 0.01** | 0.22*** | 0.18* | 0.20** |
| | (1.67) | (2.23) | (2.17) | (2.28) | (1.74) | (2.10) |
| **Outside employment** | | | | | | |
| Refugee shock | −0.08 | 0.08** | 0.05 | −9.51 | 2.44 | 0.45 |
| | (−0.27) | (2.05) | (1.15) | (−0.87) | (1.53) | (0.25) |
| Female | −0.14*** | −0.11*** | −0.13*** | −4.83*** | −3.42*** | −4.28*** |
| | (−6.46) | (−5.17) | (−6.30) | (−6.14) | (−5.28) | (−6.09) |
| Refugee shock×Female | −0.02*** | −0.02*** | −0.02*** | −1.00*** | −0.82*** | −0.87*** |
| | (−6.09) | (−5.76) | (−6.14) | (−9.29) | (−7.38) | (−7.97) |
| **Firewood and water** | | | | | | |
| Refugee shock | 0.11 | −0.03 | −0.01 | 1.90 | −0.37 | −0.33 |
| | (0.33) | (−0.43) | (−0.21) | (0.57) | (−0.53) | (−0.41) |
| Female | 0.05 | 0.10*** | 0.06* | −0.43 | 0.33 | −0.12 |
| | (1.39) | (2.67) | (1.77) | (−0.86) | (0.63) | (−0.25) |
| Refugee shock×Female | 0.01*** | 0.01*** | 0.02*** | 0.22*** | 0.17*** | 0.21*** |
| | (3.94) | (3.52) | (4.69) | (4.93) | (3.61) | (4.80) |
| **Controls** | X | X | X | X | X | X |
| **Household fixed effects** | X | X | X | X | X | X |
| Excluding Ngara | X | | | | | |
| Excluding Bukoba Urban | | X | | | | |
| Excluding emigrants | X | | | | | |
| **Observations** | 4,768 | 4,360 | 4,904 | 4,768 | 4,360 | 4,904 |

*Note:* The categories are not mutually exclusive. “Outside employment” is work outside the household as an employee or self-employed person. “Firewood and water” is collection of firewood or fetching water.

*Source.* Authors’ calculations.
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DISCLAIMER

This study has been prepared within the UNU-WIDER project on “Gender and development.” The views expressed in this paper are those of the authors, and do not necessarily reflect the views of the Institute or the United Nations University, nor the program/project donors.

ENDNOTES

1 For instance, Alix-Garcia, Bartlett, and Saah (2013) showed that in Darfur the presence of internally displaced persons in the periphery of cities led to a decrease in vegetation owing to more intense land use.
2 Note that these refugees were not in the Kagera region, which is the focus of this study.
3 The last camp in Kagera, the Lukole camp, which hosted Burundian refugees from the 1993 to 2005 conflict was closed in 2008.
4 In the KHDS the primary sampling units (PSUs) are geographical areas as defined in the 1988 Tanzanian Census. 550 PSUs in the region were classified according to eight strata defined over four agronomic zones and, within each zone, high and low levels of adult mortality. Clusters of households were drawn randomly from the PSUs in each stratum, with a probability of selection proportional to the size of the PSU.
5 In particular, the information on collecting firewood and fetching water was not included in the 2010 round. We explored the 2010 round in two previous papers (see Ruiz & Vargas-Silva, 2015, 2016). See also Maystadt and Duranton (2014).
6 Distance from a community to a specific refugee camp varied from 6 km (Lukole camp in Ngara) to 279 km (Rugwera camp close to the border of Uganda).
7 We use the highest population recorded by UNHCR.
8 There is some comparable data for other countries in the region. For instance, Charmes (2006) estimated the time spent fetching water and collecting firewood by gender for four Sub-Saharan countries around the same time as the information in our dataset was collected. His estimates for women in Benin (7 hours) and Ghana (9 hours) are higher than our estimates for Kagera, but his estimate for South Africa (1.6 hours) is lower. His estimate for Madagascar (4 hours) is close to our figures for Kagera.
9 These distances are included in order to control for possible effects related to distance to the border. Given that these distances do not change for most households over time, the measures are constructed in the same way as the shock, as \( \log(1/distance) \), and are set to zero for the first period. Table A2 in the Appendix presents the main results if we exclude these distances from the estimation. There are no major differences in the conclusions of the paper.
10 These estimations include the controls presented in Table 3.
11 In Table 7 we present only the results for time spent on different activities using the fixed effects estimation. The estimates with the Tobit estimation are very similar to these and are available from the authors on request.
12 We also checked whether changing the cut-off age by a few years (i.e., +/- 3 years) has an impact on the results and there were no major differences.
Tables A3 and A4 in the Appendix also replicate Tables 7 and 8 but excluding those individuals who left Kagera by 2004. Again, the results are robust to the exclusion of these individuals.

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# APPENDIX A1

## A1 | Variables

**TABLE A1** Description of the construction of all the variables included in the estimation

| Dependent variables | |
|---------------------|------------------|
| Farming             | Work in household *shambas* or caring for household livestock during the previous week. This includes engaging in the activity and time dedicated to the activity. |
| Nonfarming          | Work in self-employment in a nonfarm business or work for someone who is not a member of the household during the previous week. This includes engaging in the activity and time dedicated to the activity. |
| Firewood and water  | Collected firewood or fetched water during the previous week. This includes engaging in the activity and time dedicated to the activity. |

| Independent variables | |
|-----------------------|------------------|
| Gender                | Indicates that the respondent is a woman. |
| Married               | Indicates that the respondent is married. |
| Age                   | In years. |
| Literacy              | Indicates that the respondent is able to read (e.g., a newspaper). |
| Household size        | Number of members. |
| Female head           | Indicates that the head of the household is a woman. |
| Married head          | Indicates that the head of the household is married. |
| Child-to-adult ratio  | Number of children/number of adults in the household. |
| Month of the interview| Dummies to control for month of the interview. |
| Time                  | Indicates the 2004 round of the survey. |
| Distance to Uganda    | Euclidian distance from base community to border with Uganda in kilometers. Variable is set to zero for first period. Enter as log(1/distance) for second period. *Source.* Fisher (2004) with data from the Global Land Cover Network. |
| Distance to Rwanda     | Euclidian distance from base community to border with Rwanda in kilometers. Variable is set to zero for first period. Enter as log(1/distance) for second period. *Source.* Fisher (2004) with data from the Global Land Cover Network. |
| Distance to Burundi    | Euclidian distance from base community to border with Burundi in kilometers. Variable is set to zero for first period. Enter as log(1/distance) for second period. *Source.* Fisher (2004) with data from the Global Land Cover Network. |
| Refugee shock         | The sum of the pre-shock distance to each refugee camp (*Source.* Maystadt, 2004), weighted by the peak population of each camp (from UNHRC reports). Variable is set to zero for first period (i.e., interaction with time dummy). See Equation 1 in the Data and Methodology Section. |
### TABLE A2  Impact of refugee shock on likelihood of engaging in task: women vs men. Results without including distance to the borders

| Independent variable | (1)     | (2)     | (3)     | (4)     |
|----------------------|---------|---------|---------|---------|
| **Farming**          |         |         |         |         |
| Refugee shock        | 0.06*** | 0.06*** | 0.00    | 0.01**  |
|                      | (3.37)  | (3.01)  | (1.49)  | (2.10)  |
| Female               | 0.07*** | 0.04**  | 0.05*** | 0.04*   |
|                      | (3.49)  | (2.15)  | (2.66)  | (1.65)  |
| Refugee shock × Female | 0.00   | 0.01**  | 0.00    | 0.01**  |
|                      | (1.52)  | (2.40)  | (1.49)  | (2.10)  |
| **Outside employment** |       |         |         |         |
| Refugee shock        | −0.02***| −0.07   | −0.04** | −0.03   |
|                      | (−2.75) | (−3.02) | (−2.00) | (−1.48) |
| Female               | −0.11***| −0.12***| −0.11***| −0.13***|
|                      | (−6.30) | (−6.75) | (−5.81) | (−6.48) |
| Refugee shock × Female | −0.02***| −0.02***| −0.02***| −0.02***|
|                      | (−7.41) | (−6.51) | (−7.45) | (−6.37) |
| **Firewood and water** |       |         |         |         |
| Refugee shock        | 0.01    | −0.00   | 0.00    | 0.01    |
|                      | (0.48)  | (−0.10) | (0.04)  | (0.36)  |
| Female               | 0.03    | 0.06**  | 0.04    | 0.06**  |
|                      | (1.14)  | (2.08)  | (1.12)  | (1.96)  |
| Refugee shock × Female | 0.01***| 0.02*** | 0.01*** | 0.01*** |
|                      | (4.10)  | (4.74)  | (4.07)  | (4.58)  |

| Controls             | X       |         |         |
| Household fixed effects |       | X       |         |
| Observations         | 5,350   | 5,350   | 5,350   | 5,350   |

Note: The categories are not mutually exclusive. “Outside employment” is work outside the household as an employee or self-employed person. “Firewood and water” is collection of firewood or fetching water.
### TABLE A3  
Impact of the refugee shock on likelihood of engaging in/spending time on different tasks: results by literacy and math skill in first round. Excludes individuals who left the Kagera region by 2004

| Independent variable | Women | | | | Men | | | |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|
|                      | Literate | Illiterate | Math | No math | Literate | Illiterate | Math | No math |
| **Likelihood of engaging** | | | | | | | | |
| Farming | | | | | | | | |
| Refugee shock | 0.04 | 0.20* | 0.01 | 0.24** | −0.13 | −0.13 | −0.15* | −0.09 |
| (0.29) | (1.90) | (0.08) | (2.16) | (−1.61) | (−0.76) | (−1.92) | (−0.43) |
| Outside employment | | | | | | | | |
| Refugee shock | 0.27*** | −0.07 | 0.20*** | −0.02 | 0.04 | −0.03 | 0.12 | −0.11 |
| (2.90) | (−1.03) | (2.99) | (−0.28) | (0.38) | (−0.36) | (1.47) | (−0.95) |
| Firewood and water | | | | | | | | |
| Refugee shock | 0.05 | 0.28*** | 0.06 | 0.27*** | −0.20** | −0.12 | −0.25*** | −0.13 |
| (0.57) | (3.07) | (0.69) | (2.98) | (−2.26) | (−0.75) | (−3.03) | (−0.80) |
| Time spent on task | | | | | | | | |
| Farming | | | | | | | | |
| Refugee shock | 2.65 | −0.52 | 1.98 | −0.41 | −2.14 | 2.93 | −2.97 | 8.78 |
| (0.90) | (−0.18) | (0.72) | (−0.14) | (−0.57) | (0.52) | (−0.87) | (1.30) |
| Outside employment | | | | | | | | |
| Refugee shock | 1.16 | −1.74 | −0.58 | −0.39 | −1.28 | 2.56 | 0.86 | 4.16 |
| (0.36) | (−1.03) | (−0.25) | (−0.19) | (−0.30) | (0.58) | (0.21) | (0.77) |
| Firewood and water | | | | | | | | |
| Refugee shock | 1.26 | 0.54 | 1.14 | 0.77 | −2.17 | 0.66 | −2.29* | 0.85 |
| (0.93) | (0.45) | (0.85) | (0.72) | (−1.48) | (0.34) | (−1.90) | (0.39) |
| Controls | X | X | X | X | X | X | X | X |
| Household fixed effects | X | X | X | X | X | X | X | X |
| Observations | 1,548 | 1,058 | 1,550 | 1,056 | 1,610 | 688 | 1,660 | 638 |

*Note:* The categories are not mutually exclusive. “Outside employment” is work outside the household as an employee or self-employed person. “Firewood and water” is collection of firewood or fetching water. “Literate” means that the person is able to read (e.g., a newspaper). “Math” refers to the ability to perform simple mathematical operations (e.g., addition).

*Source:* Authors’ calculations.
### TABLE A4: Impact of the refugee shock on likelihood of engaging and time spent on task: Results by age cohort. Excludes individuals who left the Kagera region by 2004

| Dependent variable engaged on | 30 or less in 2004 |  | Over 30 in 2004 |  |
|-------------------------------|-------------------|---|----------------|---|
|                               | Likelihood of engaging | Time spent on task | Likelihood of engaging | Time spent on task |
| Farming                       |  |  |  |  |
| Refugee shock                 | 0.05 (0.44) | 1.36 (0.39) | −0.00 (−0.05) | 0.11 (0.87) |
| Female                        | 0.02 (0.54) | −0.28 (−0.32) | 0.06** (2.27) | 1.96*** (2.27) |
| Refugee shock × Female        | 0.01 (1.41) | 0.26** (2.25) | 0.01* (1.87) | −1.75 (−0.74) |
| Outside employment            |  |  |  |  |
| Refugee shock                 | −0.05 (−0.79) | −0.74 (−0.32) | 0.15* (1.78) | 2.85 (1.11) |
| Female                        | 0.00 (0.01) | 0.87 (1.13) | −0.24*** (−6.62) | −8.92*** (−6.73) |
| Refugee shock × Female        | −0.03*** (−8.54) | −1.58*** (−8.48) | 0.00 (1.02) | −0.08 (−0.52) |
| Firewood and water            |  |  |  |  |
| Refugee shock                 | −0.09 (−1.11) | −0.43 (−0.36) | 0.01 (1.61) | −0.40 (−0.53) |
| Female                        | 0.02 (0.73) | −0.88 (−1.59) | 0.11** (2.44) | 1.13** (2.36) |
| Refugee shock × Female        | 0.26*** (6.04) | 0.36*** (6.18) | 0.01 (1.61) | 0.05 (1.26) |
| Controls                      | X | X | X | X |
| Household fixed effects       | X | X | X | X |
| Observations                  | 2,362 | 2,362 | 2,542 | 2,542 |

Note: The categories are not mutually exclusive. “Outside employment” is work outside the household as an employee or self-employed person. “Firewood and water” is collection of firewood or fetching water.

Source. Authors’ calculations.