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Forced displacement and welfare: insights from the Rohingya crisis

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"Migración forzada y bienestar: lecciones de la crisis Rohingya"

Resumen

Este trabajo aporta evidencia sobre los efectos económicos de corto plazo del gran y concentrado flujo migratorio de Rohingyas en la comunidad local de Bangladesh. El análisis muestra los impactos de bienestar del cambio en el precio de los alimentos inducidos por el flujo migratorio en la comunidad local de Cox´s Bazar. El trabajo revela un significativo aumento en el precio del arroz en el primer mes de arribo de los migrantes, pero esto no se extiende al resto de los alimentos analizados. La gran importancia del arroz en la canasta de consumo de la población de Bangladesh da cuenta de una enorme parte de las variaciones de bienestar experimentada por los locales. El trabajo muestra la presencia de efectos distributivos resultantes del cambio en los precios relativos. Registramos fuerte inflación en los bienes mayormente consumidos por Rohingyas y locales durante el primer mes de asentamiento Rohingya. Nuestros resultados muestran un inmediata y temporal pérdida de bienestar sobre los hogares del último quintil que fue eliminada y revertida gracias a una enorme ayuda humanitaria de alimentos que encontró un gran complemento en mercados altamente integrados. Por último, el trabajo hace un análisis descriptivo de la evolución de los salarios en el distrito afectado por el flujo migratorio para ilustrar los efectos en el mercado de trabajo y lograr un entendimiento más acabado de los potenciales cambios agregados de bienestar.

Palabras clave: Consumo, Ayuda de alimentos, Migración forzosa, Desplazamiento forzoso, Comunidad local, Precios, Rohingya, Bienestar.

Códigos JEL: D12; E24; F22; F66; N3; O15; P46; R2

“Forced displacement and welfare: insights from the Rohingya crisis”

Abstract

This paper provides detailed evidence on the short-term economic effects of the large and localized Rohingya migratory shock on the Bangladeshi host population. The analysis shows the welfare impact of changes in prices of goods on the host community due to the large population influx. Rice prices are significantly higher short after the population shock started but this does not extend to other food items. Since rice is a prevalent staple in the consumption bundle of hosts, rice inflation underlies a great deal of variations in welfare. We have evidence of distributional effects due to variation in relative prices. We register large price variations for the main items consumed by Rohingyas and hosts right after the influx began. Our results show an immediate and temporary welfare loss for the bottom quintile which was eliminated and reversed due to a large food aid provided by humanitarian actors together with highly integrated markets. Finally, we provide descriptive evidence on regional wages before and after the influx to outline the effects in the local labor market and have a broader understanding of what the overall changes in welfare could be.

Keywords: Consumption, Food aid, Forced migration, Forced displacement, Host communities, Prices, Rohingyas, Welfare.

Códigos JEL: D12; E24; F22; F66; N3; O15; P46; R2

Introduction[1]

The conflict between Rohingya Muslims and Rakhine Buddhists in Myanmar is an ongoing dispute of social and religious roots which initiation dates to the twentieth century. When the country became independent in 1948 the Rohingya minority was denied a Burmese citizenship and regardless of its efforts towards achieving political autonomy, the Rohingyas remained under Burmese law. Violence between the Rohingyas and the Burmese military forces never ceased, and a first wave of migrants fled to Bangladesh during the 1990s to settle in the Nayapara and Kutupalong areas in Cox´s Bazar. There, the insurgent Rohingya group known as the Arakan Rohingya Salvation Army congregated and directed several attacks against the Burmese forces on the other side of the border during the last decade of the twentieth century. It was thought that the new century came with a sense of peace between the parties in conflict as no records of violence were registered between 2001 and 2016. However, in October 2016, a first wave of armed conflicts resurged until January 2017 and a few Rohingya families started migrating to Bangladesh and other neighboring countries. On the 25th of August 2017, the Arakan Rohingya Salvation Army undertook a coordinated attack against several Burmese police posts and one military base. This episode triggered the Burmese forces to conduct a brutal and massive attack against the entire Rohingya community in Rakhine State, an attack embedded with tortures, rapes, and murders. Consequently, beginning in late August 2017, the district of Cox's Bazar in Chittagong division, Bangladesh, experienced a dramatic increase in the number of forcibly displaced Rohingyas arriving from Myanmar, who found no choice but to leave their homes, crossing the border to Bangladesh in search of safety.[2]

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[1] Acknowledgements: I am extremely grateful to the Bangladesh Poverty Team in the South Asia Region at the World Bank for the support and guidance provided. Particularly, this paper benefited from fruitful comments by Maria Eugenia Genoni, Nandini Krishnan, Johannes G. Hoogeveen and Lokendra Phadera. I also want to distinguish the contributions of my friend and colleague Joaquin Endara Cevallos in the discussions herein included. Furthermore, I would like to highlight the importance of my advisor Mariano Tommasi and the evaluation committee for valuable suggestions. Finally, I dedicate this to Lisandro, Sandra and Gustavo for their unconditional and permanent support.

[2] We do not refer to forcibly displaced Rohingyas as refugees, following the convention adopted by the government of Bangladesh which does not award these recently displaced

Figure 1: In red the area of conflict in Myanmar, in orange the district in Bangladesh to which the Rohingyas arrived

Source: www.aljazeera.com/ (accessed July 2018).

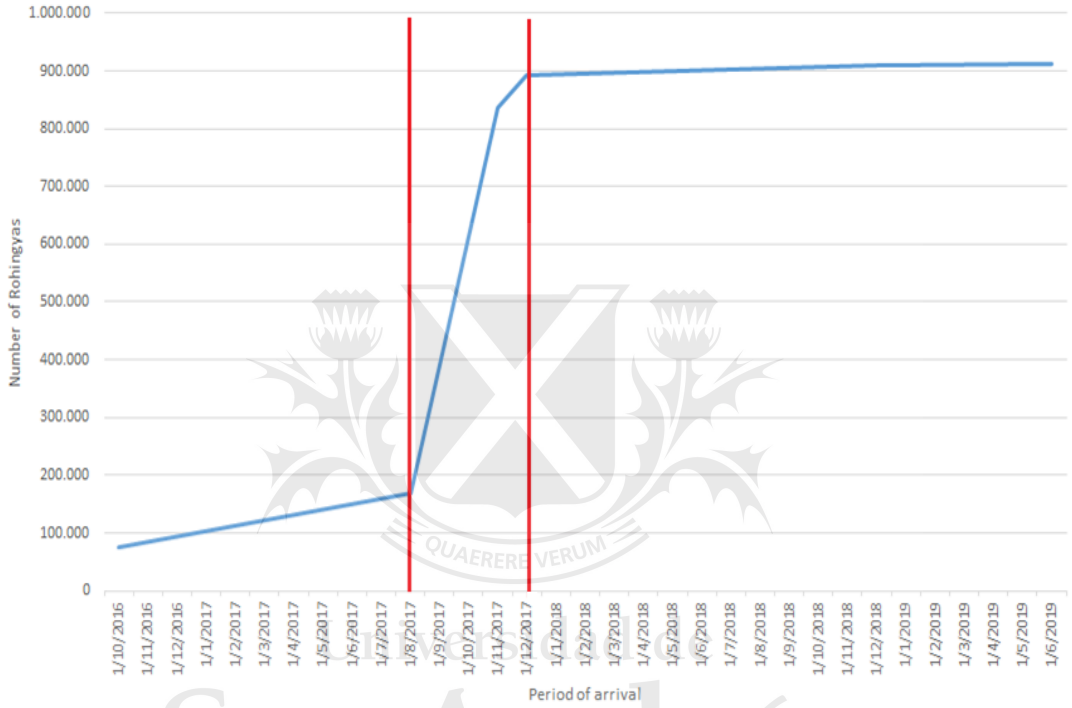
Within a period of 3 months, approximately 668 thousand Rohingyas arrived and stayed in two small sub-districts of Cox's Bazar: Teknaf and Ukhia. Around 203,400 Rohingyas who entered Bangladesh during July 2005 - 24 August 2017 were already living in Ukhia and Teknaf upazilas of Cox's Bazar. According to IOM/UNHCR, the two upazilas of Teknaf and Ukhia had a population of 500,000 Bangladeshis before the influx. In only three months, the influx represented an increase in 145 percent of the population living in Teknaf and Ukhia, and 26.7 percent of the population in the entire district of Cox's Bazar, which led to high Rohingya prevalence ratios in the affected areas: 3,74 in Ukhia and 0.47 in Teknaf.[3]

Rohingyas formal refugee status. In contrast, Rohingyas who settled in Cox´s Bazar during the first migratory waves in the 1990s do have formal refugee status.

[3] https://www.undp.org/content/dam/bangladesh/docs/Publications/Pub-2019/Impacts%20of%20the%20Rohingya%20Refigee%20Influx%20on%20Host%20Communities.pdf

By the end of 2017, the influx stabilized to reach a population of 893,108 displaced Rohingyas and by June 2019 this population increased to 910,991 driven by new arrivals and births in camps. The influx reveals a unique nature. It was unpredicted, with most

Figure 2. Influx of forcibly displaced Rohingyas to Cox's Bazar

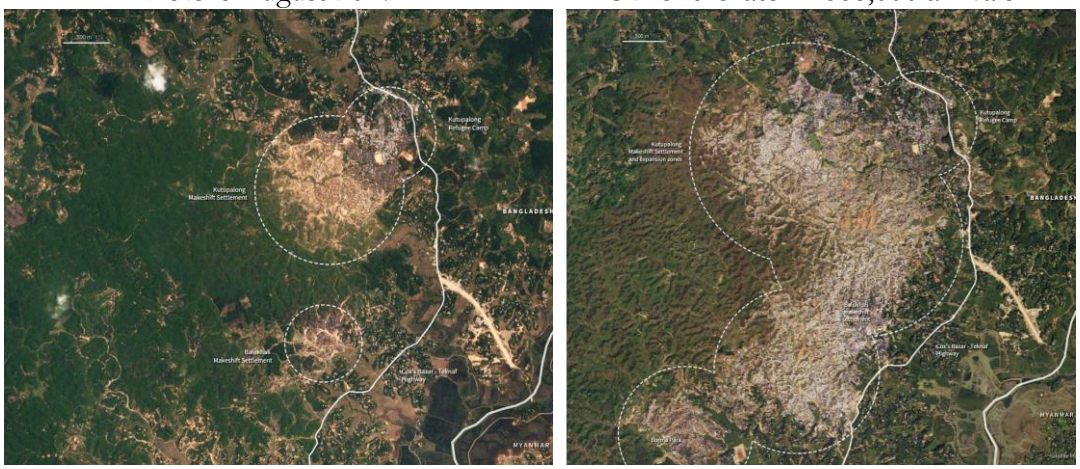


Note: Own elaboration using IOM Assessment June 2019, Cox's Bazar district.

Rohingyas entering Bangladesh during a very short time horizon (Figure 2); Rohingyas settled in a particular area of the country, the Kutupalong-Balukhali Expansion Site, now the world's largest camp (Figure 3); and this led the affected area to be one of the densest populated areas in the world with 10.7 square meters per person on average (Hill and Genoni, 2019).

Figure 3. Kutupalong- Balukhali Expansion Site

Before August 2017 3 months later – 668,000 arrivals



Note: http://fingfx.thomsonreuters.com/gfx/rngs/MYANMAR-ROHINGYA/010051VB46G/index.htm

Objective

This paper analyzes the short-term impacts of this large population shock on the well-being of the host population living in Cox's Bazar. This large population influx represents a sudden and unexpected shock to the demand for goods and services. If markets are unable to adjust, this rise in demand will be evident in rising local prices, affecting the hosting community. We study price variations over categories of grouped food items and disaggregated items. On average, we do not find significant price effects after the population shock. Nevertheless, we find short term price inflation in the price of rice, a main food item in the consumption bundle of hosts and forcibly displaced Rohingyas. We consider the effect did not persist due to a rapid adjustment of markets and a large food supply response by the main humanitarian actors reflected in a spike in rice imports. We use a partial equilibrium model to quantify the potential short term impacts due to changes in prices of goods. We exploit the data to calculate the variation in hosts welfare by estimating the compensating variation, also known as the first-order impact. Our findings suggest a small loss of welfare in the host community during the first month after the influx. The most affected subgroup of hosts is that in the bottom quintile of the distribution of consumption expenditure. Nonetheless, effects are not

substantial and welfare implications are reversed the further from August 2017 we get. Finally, we undertake a descriptive analysis of the evolution of inflation adjusted wages in the area with data for six years before the influx and one year after. Although we consider the Rohingya labor force a noble substitute of local workers we do not observe a depression of local wages. The most likely explanation under this finding is that recently displaced Rohingyas are not legally allowed to work. Hence, we expect local labor market effects to be negligible.

Related literature

There is little evidence of the impact of forced migrants on host communities. In a review of 54 empirical studies in this regard, it is pointed out that the probability of a negative and statistically significant impact on hosts' welfare is below 20 percent (Verme and Schuettler, 2019). Relevant to our study, the authors outline that the probability of finding effects in prices is 80 percent, where increases and decreases are equally distributed across studies, and most of the studies they analyze focus on effects in housing prices. Although the authors claim that large crises have been associated with adverse effects on the host communities, these effects do not persist long. A few papers examine the implications on goods markets: (Balkan and Tumen, 2016) exploit the regional variation in the unexpected inflow of Syrian refugees to estimate the impact of immigration on consumer prices in Turkey. They find that the general level of consumer prices has declined by approximately 2.5 percent due to immigration; (Lach, 2007) shows that the arrival of immigrants from the Soviet Union to Israel in 1990 significantly reduced prices in Israel.

Price effects of the Rohingya influx in Cox´s Bazar were suggested to be small and the welfare consequences were mainly harnessed to a considerable reduction in local wages which led to higher poverty in the area (Hill and Genoni, 2019). The contribution of our paper is to show that price effects vary over time and items in a non-trivial way. We do find high price inflation in food items consumed by recently displaced Rohingyas and their neighboring hosts in the short run. We register a spike in the price of rice in the first month after the influx began, a key statistic supporting how

unexpected the population influx was; a large increase in rice imports in the second half of 2017; highly integrated markets and large humanitarian aid that contributed to smooth rice inflation and no depression of local wages in 2018.

We follow an approach already exploited by several papers in the literature of welfare. Welfare implications due to variation in food prices has been a topic of interest in developing countries where hosts take a double role as they perform as producers and consumers. A farm-household model was typically used to assess this double role of households (Singh et al., 1986) and the first-order approximation to the welfare impact of price changes on households has been done for Brazil using spatially disaggregated monthly price data. The main finding is that middle-income households experienced larger proportional losses than those at the bottom of the distribution (Ferreira et al., 2012). Rice price changes have been addressed using a non-parametric estimation and kernel smoothing techniques in Madagascar, where poor farmers experienced large negative welfare effects and the gains from higher rice prices were absorbed by the largest rice farmers (Barret and Dorosh, 1996). Our results are in line with this finding, although we refer to all households in the sample, and differ from what was found for Brazil. Additional evidence is provided under a non-parametric variant in Thailand, where rice is a main staple in the consumption bundle of net-consumer households. The paper analyzes the distribution of real income to variation in rice prices, concluding that the largest gains are faced by rural households at the middle of the income distribution (Deaton, 1989).

In our study, price effects are not long-lasting, as suggested in (Verme and Schuettler, 2019), and welfare implications are small. In addition, we find regressive effects across household quintiles of consumption expenditure. We consider integrated markets together with humanitarian action to be crucial in smoothing the initial welfare losses levied on the most vulnerable households. Unfortunately, although there is anecdotal evidence of a substantial food aid in the area short after the influx started, we are unable to account for its empirical implications due to lack of high frequency data. This is a terrible loss for this paper since we consider extremely relevant to provide

detailed evidence about the importance of humanitarian aid as a smoothing mechanism of welfare losses in contexts alike.

Theoretical framework

The model outlines an expression for the compensating variation used to analyze partial changes in hosts' welfare. Consider a scenario in which a consumer maximizes utility given market prices. Now assume prices change. This will affect the consumer's optimal choice and consumption bundle. The compensating variation accounts for the monetary compensation required to return the consumer to the previous optimal utility level under new prices. This measure allows us to quantify one aspect of the welfare implications of the population shock, concentrated in Cox's Bazar, on the host community.

Following (Friedman et al., 2011), the compensating variation can be expressed as

$$CV = e(p_0, u_0) - e(p_1, u_0) = \frac{\partial e(p, u_0)}{\partial p}(p_1 - p_0),$$

where $e(p, u)$ is the conventional minimum expenditure function and the compensating variation the resulting first order Taylor series expansion around it. Notice that $\frac{\partial e(p, u_0)}{\partial p}$ is equal to quantities consumed, *q*. Hence, the compensating variation can be rewritten as

$$CV = q\Delta p$$

Alternatively, we can rearrange it as a function of the budget share and price variation of goods

$$\frac{CV}{\sum_{i=1}^{n} q_i p_i} = \frac{\sum_{i=1}^{n} w_i \Delta p_i}{p_i},$$

where $w_i = \frac{q_i p_i}{\sum_{i=1}^{n} q_i p_i}$ represents the budget share in good *i*. This expression for the compensating variation does not include substitution effects that arise in response to price variations. Those substitution effects would be captured in a second-order Taylor expansion that enables to estimate cross price elasticities (Friedman and Levinsohn, 2002). Welfare analyses accounting for substitution effects were conducted on four Latin American countries and the effects found were regressive across household income quintiles (Robles and Torero, 2010). Our findings are in line with this evidence. The first-order approximation approach also ignores general equilibrium effects as it does not count for changes in wages, which in developing economies are endogenous to food prices due to high labor force participation in agriculture (Jacoby, 2015). However, most Bangladeshis report a steady and time invariant diet based on rice, lentils, curry, fish and green vegetables for the period we consider in this study. In addition, the period of analysis we use is short and factor markets take time to adjust. This is important as cross-price elasticities can be ruled out of the analysis without mayor precision losses.

As we have already mentioned, a non-negligible quantity of households' total consumption in this country derives from consumption of self-production. When calculating the compensating variation, this must be included as greater savings and not as greater costs if the price of self-produced goods increases. In our aim to minimize measurement error when estimating the compensating variation, we will account for expenditures in self-produced goods as negative expenditures to obtain a net welfare effect.

Data on Bangladeshi households' consumption patterns

The analysis relies on the Household Income and Expenditure Survey (HIES) 2016/17 collected by the Bangladesh Bureau of Statistics (BBS). This cross-sectional survey is the main official source of information about households' consumption patterns, income sources and poverty. Consumption data is collected over a list of 316 items. The HIES 2016/17 is representative at the district level (e.g. Cox's Bazar) and was collected from April 2016 until March 2017. The survey covers Bangladeshi

households and as data collection preceded the Rohingya influx, excludes recently arrived Rohingyas. The analysis presented below is representative of households living in the district of Cox's Bazar, and the sample size for the analysis is 720 households. We use consumption patterns to estimate consumption aggregates for all households settled in the district of Cox's Bazar. For accuracy maximizing purposes, if households did not report the information needed to estimate unit values, we followed a nearest neighbor approach and imputed the median unit value obtained for the closest geographic area.

Price data

To simulate the impact on prices it was important to quantify the change in prices of different goods before and after the influx. We rely on daily price information obtained from the website of the Department of Agricultural Marketing (DAM) for the main market of Cox's Bazar. The data was collected between January 2016 and June 2018 which was used for 54 food commodities. Considering budget shares estimated using HIES 2016/2017 data, we restricted our analysis to those food items identifiable in HIES. For purchased and self-produced items, we obtained DAM prices for different types of rice, pulses, fish, eggs, meat, vegetables, sugar, oil, flour and fruits. We mapped this list to the one in HIES. Nonetheless, heterogeneity between varieties within items exist between HIES and DAM (e.g. "Rice" includes different types of rice) so the mapping is not perfect[4]. When that was the case, we calculated the average inflation rate using prices within category from our DAM list of items and mapped it to its HIES analog.

Data on wages

This paper culminates with a descriptive analysis on the evolution of local wages in the district of Cox's Bazar. We obtained nominal wages data from the Agricultural Yearbooks elaborated by BBS from 2011 to 2018 to build a series for the average daily wage per year. For reasons we ignore, no Agricultural Yearbook is

[4] Categories composition is shown in Appendix I.

available for 2017, the year of the influx. For better comparability, we adjusted nominal wages to 2017 values using the publicly available CPI series for Bangladesh published by The World Bank[5].

Modelling the impact on prices of goods

According to our estimates, the recent Rohingya influx translated into local price inflation in a way that results abnormal to typical price dynamics. Table 1 shows the net inflation rates by and across food categories for different periods of analysis, beginning in August 2017 to March 2018. Using data on past inflation by period for the previous year we were able to control for seasonality. No price data was available for December 2016 (making it not possible to control for seasonality) or January 2018, so inflation rates for the periods August-December and August-January are not included in our study. Although markets serving local customers have good availability of key commodities, according to our estimates the price of "Rice" increased by above average in the first month after the influx, roughly reaching 10 percent inflation rate. Rohingyas in camps represent a population whose diet is mostly based on rice.[6] Therefore, the population shock triggered demand for "Rice", pulling inflation in this category much more than in any other. Rice is also a dominant staple in the Bangladeshi diet, with more than 14 percent budget share of an average Bangladeshi household. The change in the price of "Rice" is remarkable during the first month after the influx began, suggesting that the strong response of humanitarian actors who provided new Rohingyas with large amounts of rice (coarse) didn't happen immediately after the influx began. This is a key statistic supporting how unexpected this large population shock was.

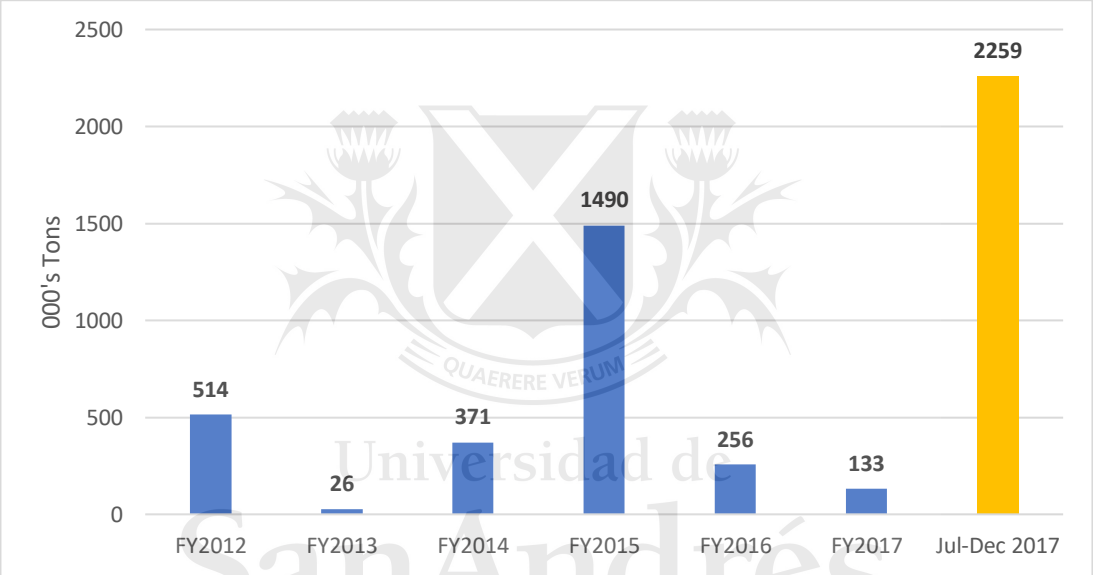
Even before the influx, Bangladesh was in insufficient availability of rice to feed its own population and needed to import, mostly from neighboring South Asian

[5] https://data.worldbank.org/indicator/FP.CPI.TOTL?locations=BD

[6] This information was obtained from the Cox's Bazar Panel Survey, a joint effort of The World Bank and Yale University. The survey was conducted over hosts and Rohingyas in 2019. Nonetheless, drawing precise budget shares for Rohingyas is not straightforward since they do not purchase food and estimating unit values constitute a big challenge.

countries like India, Vietnam, and Cambodia. Figure 4 shows rice imports in thousands of tons since 2012. Fiscal years go from 1st July to 30th June of the following year. The country experienced a substantial increase in the volume of rice imports during the semester the Rohingyas arrived. In the last six months of 2017 Bangladesh imported almost 17 times more rice than in the previous twelve months. Anecdotal evidence supports this was mainly driven by humanitarian action.[7] We believe that food aid alleviated the immediate excess of demand, offsetting the initial price effect.

Figure 4. Rice imports from 2012 to first half of 2018 fiscal year



Note: Own elaboration using UNDP data[8].

The main humanitarian actor also supplied large quantities of palm oil, lentils (masur) and wheat flour in camps[9]. Given the data available, we must restrict our analysis to the price of wheat flour, which only represents 0.2 percent of the hosts' total budget share. In this case, we find a positive price variation in the first period, that

[7] https://www.wfp.org/news/new-rohingya-arrivals-bangladesh-risk-poor-diets
[8] https://www.undp.org/content/dam/bangladesh/docs/Publications/Pub-2019/Impacts%20of%20the%20Rohingya%20Refigee%20Influx%20on%20Host%20Communities.pdf
[9] At first, food aid was composed by general food distribution. For a better understanding of beneficiary status, E-vouchers were implemented. These vouchers have a credit limit and are used by Rohingyas in camps to purchase food items, which they get from a distribution center.

places the price of flour at an upper level. Nonetheless, this new price level remains steady until March 2018, except for November 2017, when it rises an additional one percentage point. After that, it returns to the price registered in September 2017. Large price variations are shown for "Tomato" and "Brinjal" (eggplant), which by March 2018 experienced the largest deflations. On the contrary, "Other fruits" report the highest inflation rates by the end of the period, reaching more than 38 percent from August 2017 to March 2018. Finally, we find that on average there has been deflation in all periods since August 2017, but this breaks down for weighted inflation rates, which are of very small magnitude in all periods.

A key characteristic about food markets in Bangladesh is that variation in prices across markets is small. [10] This is also consistent with previous studies which have indicated that food markets are relatively well integrated, well developed and efficient in Bangladesh.[11] If markets are well integrated the rapid increase in demand for food can be met by increased supply from other areas. These can be sourced easily from other parts of the country and whilst the increase in demand is large in affected areas, it is not large in the context of Bangladesh.[12]

Table 1. Consumption budget shares and food price inflation estimates (%) by different periods

Food categories	Budget shares	Inflation rates				
		Aug-Sep	Aug-Oct	Aug-Nov	Aug-Feb	Aug-Mar
Rice	14.16	9.66	0.05	0.72	0.22	-4.58
Pulses	1.13	-5.98	-5.98	-9.45	-12.51	-13.2
Hilsa fish	0.67	-7.9	-7.73	-12.28	-22.15	-27.2
Katla fish	0.14	-0.14	-0.14	-0.14	-0.1	-0.1
Pangash fish	2.88	0.74	0.74	0.74	8.15	8.15
Telapia fish	1.92	0	0	0	0	0
Other fishes	2.75	0	0	-11.45	-8.11	-8.11

[10] Market Assessment in Cox's Bazar. Bangladesh Food Security Sector and the United Nations World Food Programme. November 2017.
[11] Market Assessment in Cox's Bazar. Bangladesh Food Security Sector and the United Nations World Food Programme. November 2017.
[12] Market Assessment in Cox's Bazar. Bangladesh Food Security Sector and the United Nations World Food Programme. November 2017.

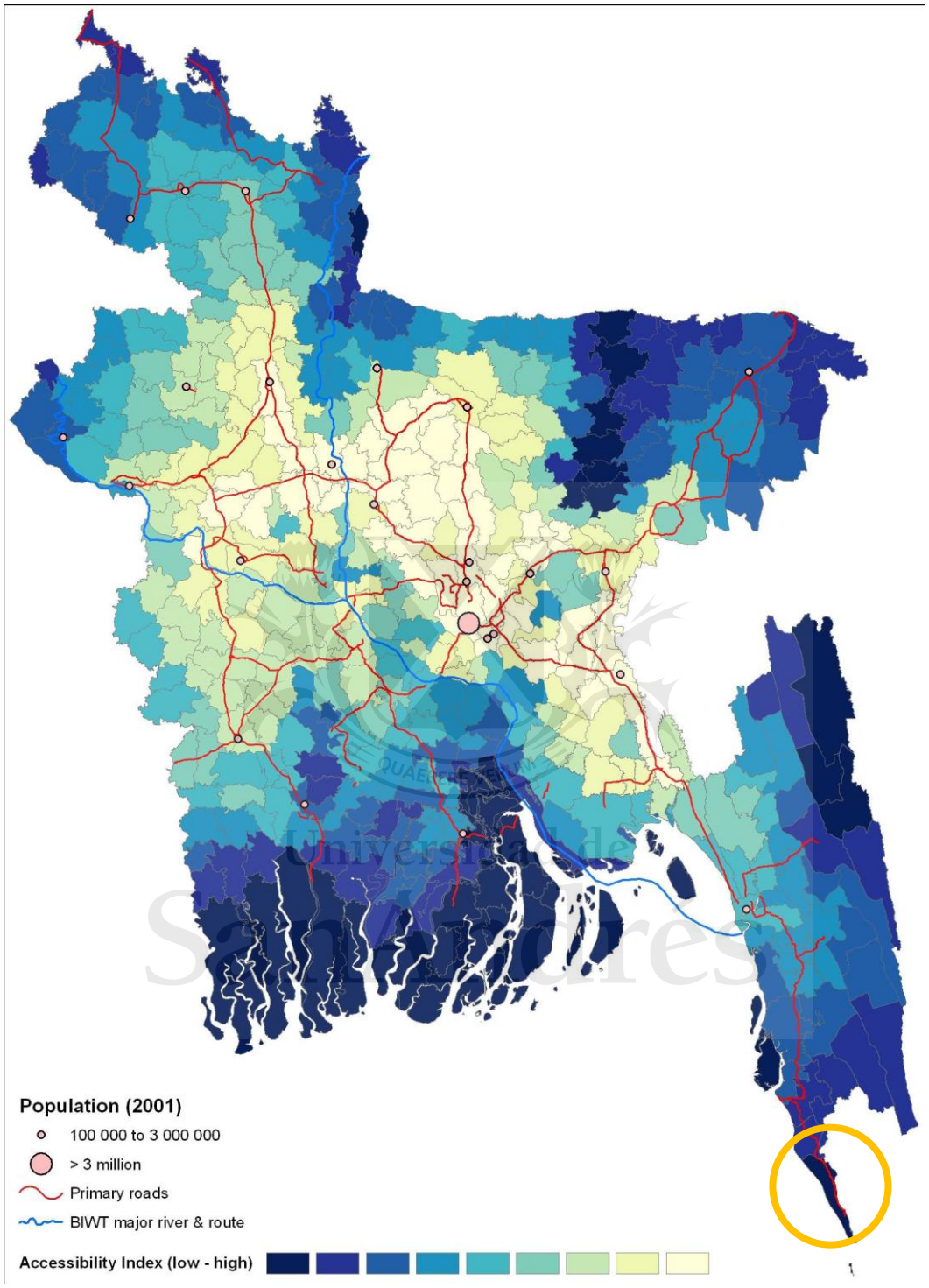
Eggs	0.81	4.02	1.4	4.98	4.98	2.4
Hen	2.36	-4.51	-3.28	-6.44	1.9	1.74
Brinjal	0.46	-12.83	8.04	-33.83	-41.85	-65.71
Tomato	0.56	-49.09	-49.83	-23.78	19.58	-57.1
Potato	1.45	-3.21	-3.21	-6.18	-25.46	-4.97
Other vegetables	1.95	-6.34	-2.46	3.74	-3.19	-17.1
Papaya	0.41	-1.25	-1.25	-7.55	-15.99	-15.99
Apples	0.94	0	0	0	2.11	3.45
Bananas	0.79	-1.33	-1.33	-1.33	-1.33	-1.33
Other fruits	1.33	0.27	0.27	9.09	12.77	38.33
Sugar	0.58	-5.81	-7.65	-8.25	-8.71	-9.04
Mustard oil	0.01	0	0	0	-1.71	-1.71
Flour	0.21	2.89	2.89	3.89	2.89	2.89
Palm	0.00	0.79	0.79	0.79	-2.27	0.79
Average change		-3.81	-3.27	-4.61	-4.32	-8.02
Weighted inflation		0.65	-0.54	0.76	0.60	1.52

Note: Information from the DAM retail price database for Cox's Bazar for 54 products. Using the average price in August 2017 as the baseline (excluding six days at the end of the month when the inflow of forcibly displaced Rohingyas started). Values in all periods are net of seasonality from the inflation registered in the same period of the previous year. The price changes for the 54 food commodities summarized according to the food categories used in HIES 2016/2017. December and January have been excluded as no price data is available for December 2016 or January 2018.

Figure 5 displays a map corresponding to a Market Accessibility Index in which the primary roads across the country are identified. Deichman (1997) uses an accessibility index identified as the sum of the population of urban centers in the vicinity of each point in the country which is inversely weighted by the travel time to each urban center along the primary road network. This is the index we use for market accessibility shown in Figure 5 elaborated by Blankespoor and Yoshida in 2010. Although market accessibility in the affected area is low relative to the Dhaka area, Rohingyas in camps and their surrounding hosts are settled very close to the Ukhia-Teknaf road. This road is the red segment under the orange circle located in the southeast region of the country and it connects the most important cities in the district of Cox's Bazar. Therefore, although the Cox's Bazar district appears to be an isolated

area following a Market Accessibility analysis, we must keep in mind that Bangladesh is a small country. According to GIS coordinates, the travel distance from Ukhia to the closest highly integrated area in Baraiyarhat is below six hours. This facilitates connectivity between the affected areas and the most integrated region in the center of the country, easing food supply in areas of high Rohingya prevalence.

Figure 5. Market Accessibility Index



Note: Blankespoor and Yoshida, 2010.

Overall, markets in the affected locations are well connected to the larger markets. Court Bazar, Ukhia Bazar, Teknaf Bazar and Nhilla Bazar constitute the four main distribution centers in the area neighboring Rohingya camps. Other six smaller markets along the Ukhia-Teknaf road that reach Rohingyas in camps are mainly supplied by the large four markets. Although the influx disrupted the logistics in the area, market assessments support the view that these ten markets are very well connected.[13]

In addition to changes in the prices of food items, we address changes in the price of firewood, given its prevalent importance in the daily life of a Bangladeshi household. The Refugee Emergency and Vulnerability Assessment (REVA) assessed that 96 percent of local households use firewood as the main cooking fuel. This compares with 44 per cent for Bangladesh overall (BBS, 2018). 47 percent declare buying it and we estimate a budget share of 3.37 percent. Lack of access to alternative fuels and easy availability of forest resources may have contributed to this dependence on firewood. Forcibly displaced Rohingyas use firewood for cooking purposes too. Consequently, the population influx induced shifts in demand for firewood. Although we do not have high frequency data on the price of firewood, WFP has documented that after the influx, firewood was mostly identified as being in insufficient availability and between August and November 2017 its price increased by 58.3 percent.[14] The environmental impact manifested in the depletion of neighboring forests can be seen in Figure 3. Unfortunately, the lack of high frequency data does not allow us to include variation in the price of firewood in our compensating variation analysis.

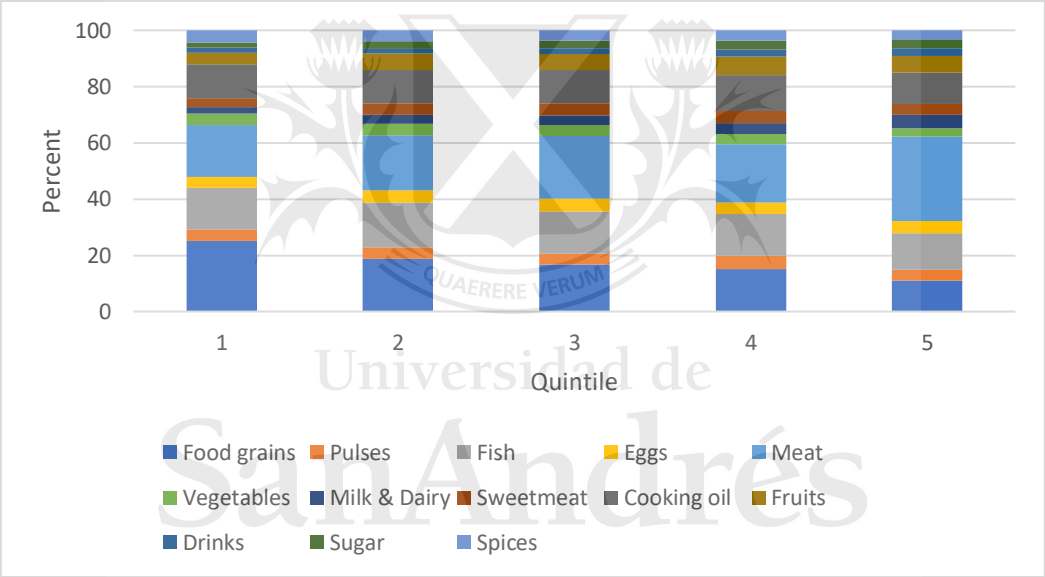
Consumption and production patterns: the incidence of changing prices

Price increases will have the largest impact on poverty when they occur for the goods that are mostly consumed by poor households. As shown in Table 1, "Other fruits" experienced the highest inflation rate between August 2017 and March 2018,

[13] WFP Market Assessment (2017)
[14] Market Assessment in Cox's Bazar. Bangladesh Food Security Sector and the United Nations World Food Programme. November 2017.

but they are not greatly consumed by Bangladeshi households at any point of the distribution. Figure 6 shows the pattern of food consumption of households in the area. "Food grains", "Fish" and "Meat" account for the largest share of consumption. Almost all consumption shares by category remain stable across quintiles. Nonetheless, as we move from the first to the last quintile, "Food grains" consumption is replaced for "Meat" consumption. For the poorest decile, "Food grains" (primarily composed by rice) account for 25 percent of all food consumption, and "Meat" account for 18 percent of total food consumption. Instead, for the last quintile, "Food grains" represent 11 percent of total food consumption and "Meat" represent 30 percent.

Figure 6. Food consumption patterns by consumption quintile

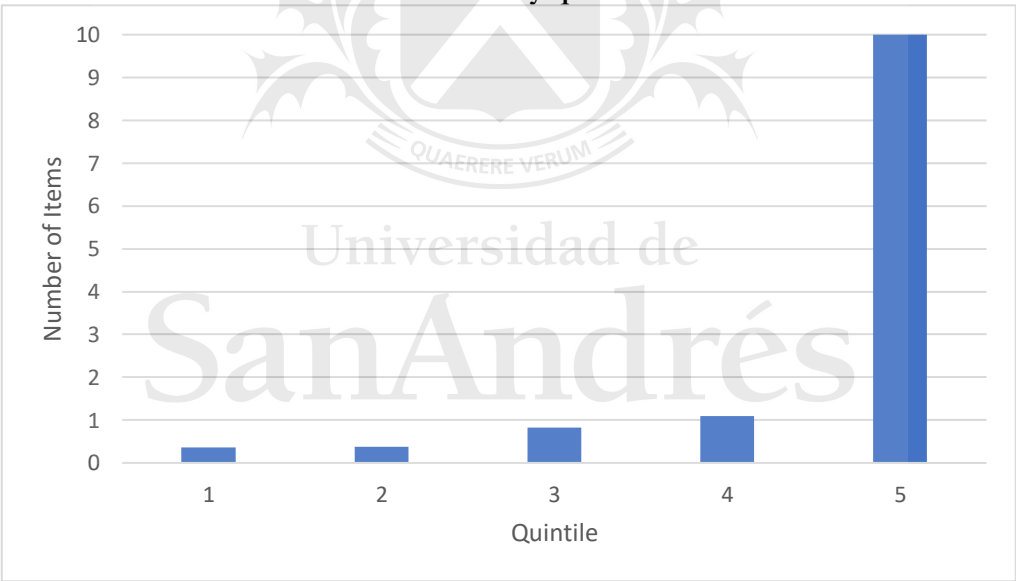


Note: Own calculations using HIES 2016/17, Cox's Bazar district. The figures show the food budget share for each food category.

Furthermore, price increases registered for specific food items will not universally have a one-sided impact on host households as some households produce some of the food they consume, which alters the direction of the impact. Figure 7 shows the average number of items consumed from own production per household by consumption quintile. The last quintile shows the greatest number of items consumed

from own production. Results may seem counterintuitive in a first approximation as one would expect households in the first quintile to account for consumption of many self-produced items rather than purchasing them. Nonetheless, our finding can be explained by the fact that in Bangladesh, workers living in poor households normally work for daily wages and do not produce. As quintiles are built upon consumption of food items, we see that those who report the greatest consumption values are the ones who produce the most, amongst consumers. It follows that we should consider this group of consumers to be better off than the rest, as they belong to the last quintile of the distribution of consumption expenditure. A priori, using information on consumption shares and prices of food items, the compensating variation is expected to be smaller (larger) if positive (negative) as we reach the top of the distribution.

Figure 7. Average number of items consumed from own production per household by quintile



Note: Own calculations using HIES 2016/17, Cox's Bazar district.

Taking the model to the data: estimating the compensating variation on hosts

Taking these elements into account, the impact of varying prices on poverty for the host community is estimated to be small.[15] Using price changes between August 2017 and March 2018, we estimated the average compensating variation for the same periods net inflation data were shown in Table 1. We extend our analysis and show our estimates by period and quintile.[16] These findings are shown in Tables 2 and 3.[17] In a context of inflation, the compensation variation is negative in sign. A small compensating variation of BDT -5.80 is estimated for the first month after the influx. Given price inflations and food consumption patterns shown in Table 1 and Figure 6 respectively, we can say that this is mostly driven by the price inflation estimated for "Rice" and "Flour", which combined with their consumption shares offset the negative effects of other food items with negative inflation rates. Nonetheless, the compensating variation is reversed and changes magnitude the further away we move from August. Although we find a negative effect on hosts' welfare due to price inflation, it lasts for only one month. After September 2017 hosts seem to be better off compared to the previous year assuming their consumption patterns remained unchanged. In March 2018, a member in an average household needed to "lose" more than BDT 40 to reach the same utility level as in August 2017 at new prices. When disaggregating by quintile,

[15] This simulation relies on the HIES 2016/17 for the district of Cox's Bazar to reflect the baseline welfare conditions in the affected upazilas more closely. The simulations consider 2 effects: (i) the changes in the cost of buying food; (ii) the fact that some household produce food and consume part of that production. In other words, we simulated the impact of the price increase on poverty by re-estimating the cost of basic needs considering the price variation and assuming that the total amount a household spends on consumption remains constant with one exception: the value of consumption decreases for those that consume from own production as long as the price used to estimate the value of this consumption has decreased. Conservative assumptions have been used to generate these estimates, but estimates are still likely to overestimate the immediate impact on poverty as households will adapt to changing conditions. Some of the adaptation measures will not have any impact on welfare, for example substituting towards cheaper but still nutrient-rich sources of food given the change in relative prices.

[16] The exchange rate USD-BDT for the period under analysis varied between 1-79 to 1-82.

[17] The sum of the budget shares of the list of items examined in our exercise constitute about 35,49 percent of the total budget share of an average Bangladeshi household.

we find that the first quintile accounts for the largest compensating variation across quintile groups with BDT -17,11. The compensating variation across quintiles in September 2017 experiences a reduction as we move bottom-up the distribution, being the last quintile the only for which the compensating variation is positive in the first month after the influx. For the rest of the periods, hosts were better off regardless of consumption quintiles. The pattern we find in the other four periods of analysis is much alike the one in September 2017: as we move bottom-up the distribution, the compensating variation increases, meaning wealthier hosts are relatively better off than the rest of consumers. In conclusion, we do not find a long-lasting negative impact of the Rohingya population influx on hosts' welfare. Instead, although hosts went through a loss of welfare short after the beginning of the influx, with poor hosts the most affected subgroup, in the end all locals were better off by March 2018 regardless of a more regressive distribution of wealth.

Table 2. Compensating variation estimates in BDT by period

Period	CV
Aug-Sep	-5.80
Aug-Oct	19.43
Aug-Nov	19.88
Aug-Feb	15.49
Aug-Mar	40.41

Note: Own calculation using DAM prices and HIES 2016/2017 budget shares.

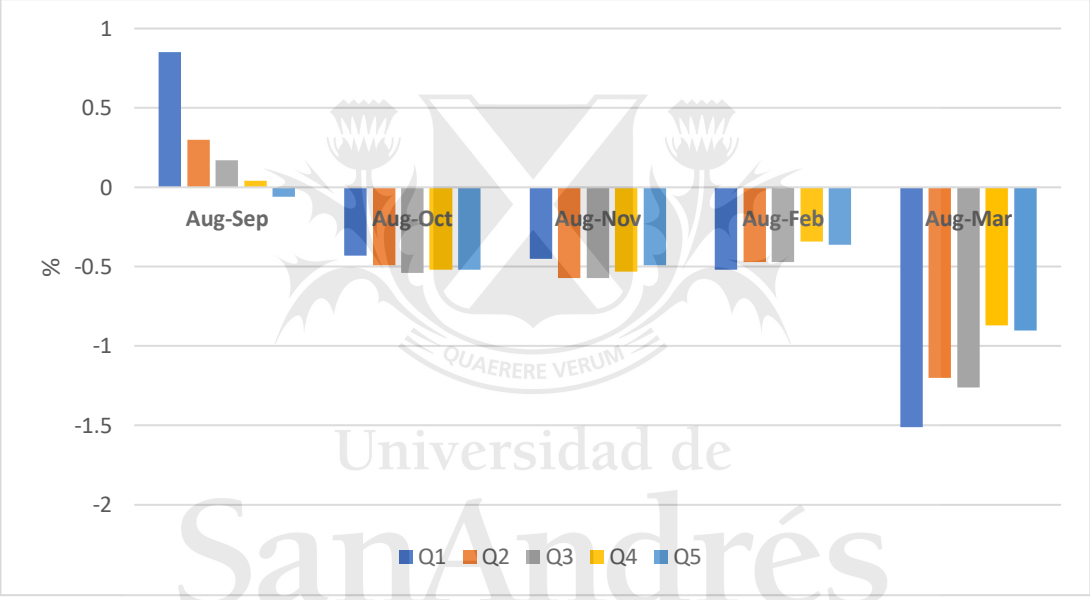
Table 3. Compensating variation estimates in BDT by period and quintile

Quintile\Period	Aug-Sep	Aug-Oct	Aug-Nov	Aug-Feb	Aug-Mar
1	-17.11	9.34	10.09	11.06	31.95
2	-8.69	14.42	16.82	13.84	35.54
3	-5.85	18.68	19.80	16.34	43.46
4	-1.20	21.95	22.42	14.37	36.51
5	4.40	33.57	30.87	22.11	55.22

Note: Own calculation using DAM prices and HIES 2016/2017 budget shares.

Our results do not support the idea that the impact of changing prices on hosts' welfare has been significant. Figure 8 shows what could be considered a lower bound of the first order incidence of the change in prices since those variations are over the total per capita expenditure. Results are in line with those reported in Tables 2 and 3, with the strongest regressive effects arising one month after the influx began and with households in the first quintile being the most affected.

Figure 8. Percentage change in monthly per capita expenditure by period and quintile

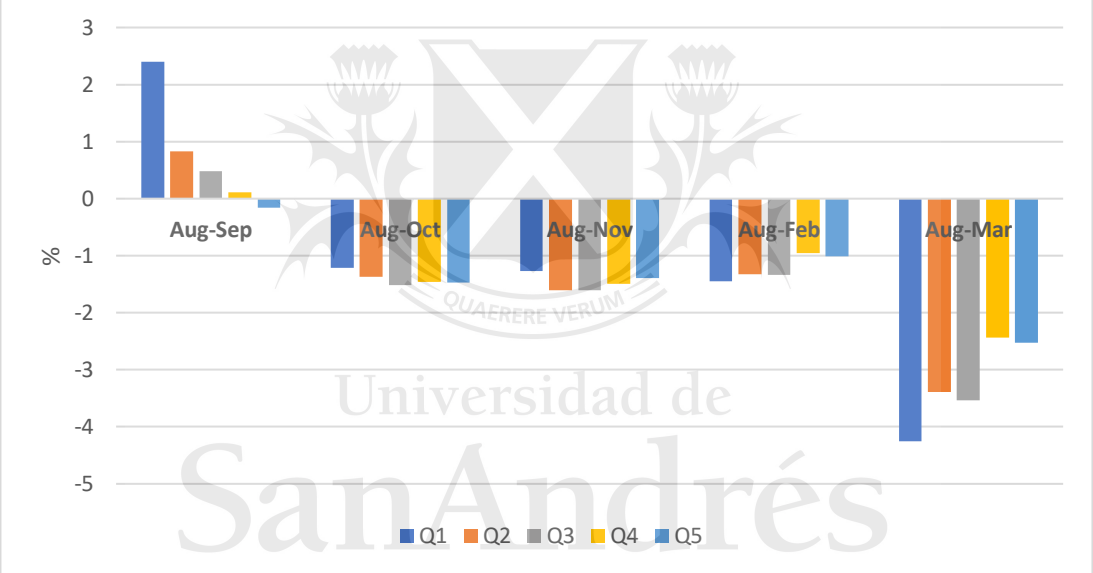


Note: Own calculation using DAM prices and HIES 2016/2017 budget shares.

As mentioned above, our estimates of the compensating variation include a list of items that account for 35,49 percent of an average household budget share. Aiming to overcome this problem, we scaled the per capita expenditure by 0.3549 to see what the relative incidence for the share of items herein included is. Results are shown in Figure 9. The largest change is experienced by consumers in the first quintile during September 2017, who faced 2.4 percent increase in their per capita expenditure. It follows that not even for the most affected group of consumers do we find

economically meaningful long-lasting changes. Furthermore, the original change is reversed in March 2018. This reversion is caused by price variations as consumption shares were held constant for all periods. In conclusion, although poorest hosts were those mostly affected by the Rohingya influx immediately after the influx began, they were better off once the influx stabilized. If their consumption patterns did not change across time, the influence of humanitarian actors providing food aid in camps together with highly integrated markets could be under the explanation of this phenomenon.

Figure 9. Percentage change in monthly scaled per capita expenditure by period and quintile



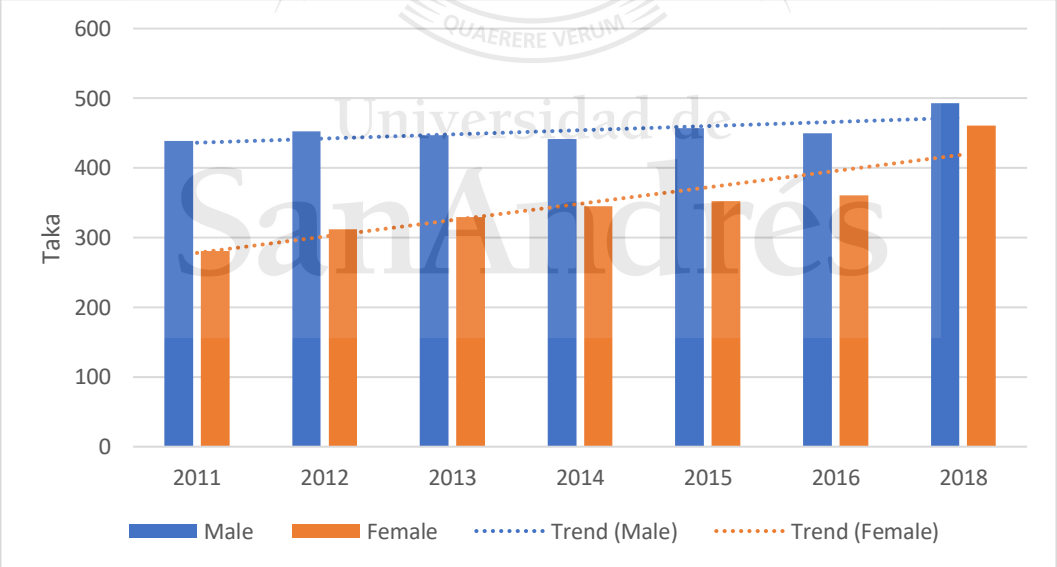
Note: Own calculation using DAM prices and HIES 2016/2017 budget shares.

Local wages: a simple descriptive analysis

For a broader understanding of the general welfare impact of the influx we follow the evolution of local wages before and after the arrival of Rohingyas. Recent evidence in this regard suggests that when migrants perform as noble substitutes of local laborers, the labor supply shock translates to a depression of local wages. As a matter of fact, Rohingyas are a very decent substitute of local unskilled workers since

most of them used to be enrolled in agricultural activities back in Myanmar[18]. The large migratory inflow of Venezuelans to Colombia caused meaningful reductions of local informal wages. The study shows that a 1 percentage point increase in immigration from Venezuela reduces informal sector wages by 10 percentage points in urban areas under an instrumental variables approach (Caruso et al., 2019). Due to the low frequency of the data available (one observation per year) we are limited to a descriptive analysis of the evolution of wages in the district of Cox's Bazar as an alternative to a preferred regression analysis. Figure 10 shows the series for inflation adjusted average daily wages in the district of Cox's Bazar. We do not find any meaningful effects in the labor market. Forcibly displaced Rohingyas are a good substitute for local unskilled laborers but the government of Bangladesh does not allow them to work, minimizing any potential displacement that may arise in this factor market.

Figure 10. Evolution of average daily wages by year in Cox's Bazar



Note: Own elaboration using Agricultural Yearbooks 2011-2018 data (excluding 2017).

[18] Estimate obtained from the Cox's Bazar Panel Survey (CBPS). This is the first representative survey of hosts and Rohingyas in Cox's Bazar and it was implemented in 2019.

Concluding remarks

This study provides strong evidence to understand the short-term welfare consequences of the Rohingya influx in Cox's Bazar, combining and harmonizing several data sources to inform about the welfare conditions in the area exploiting price variations. Using representative survey data on local households' consumption patterns and web scrapped data on prices in the main market of Cox's Bazar we follow a first-order approximation approach to address the local welfare effects of the large influx in the area. We do not find significant price inflation across food items for the period under study. However, price inflation resulted high for "Rice" in the very short run after the population shock began and very likely prior to strong humanitarian action providing forcibly displaced Rohingyas with food aid.

Overall, the analysis presented indicates that at least in the short run the impacts have been highly localized, with those in the bottom of the distribution the most affected group of consumers. Under this approach, despite the initial loss of welfare hosts resulted better off in March 2018 relative to August 2017. Although we are unable to present any data confirming how strong humanitarian aid was, market assessments and data on rice imports strongly support the fact that a large influx of aid strengthened purchasing power in the local economy. Estimating to what extent hosts benefited from the large food supply is a key question that demands further investigation and motivates future research.

We have also shown that there is no evidence of negative effects in the labor market. Although we would expect displacement effects in this market due to a high degree of unskilled labor substitutability between Rohingyas and Bangladeshis, working prohibitions imposed by the government of Bangladesh on Rohingya labor force have ruled out all possibilities of concretion of this hypothesis. In contrast, we observe higher wages after the influx and a substantial reduction in the local gender wage gap.

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Appendix I

Food Category	HIES	DAM
Rice	Fine, Medium, Coarse, Beaten, Pop, Puffed	Ata loose, Ata packet, Boro coarse, Boro fine, Boro medium, Muri
Pulses	Lentil, Chickling-vetch, Green gram, Pea gram, Other	Masur imported ordinary, Masur imported superior, Local masur
Other fishes	Boal, Air, Magur, Shing, Koi, Carp, Shoal, Gajar, Taki-Puti, Malacachi, Chala-chapila, Nilotica, Other small fishes	Laitta, Rupchanda
Eggs	Hen egg, Duck egg	Farm white egg
Hen	Hen	Local big hen, Farm hen
Brinjal	Brinjal	Brinjal ordinary, Brinjal superior
Potato	Potato	Potato white, Local potato
Other vegetables	Water gourd, Balsam apple, Perbol (patal), Snake gourd, Ribbed gourd, Arum, Ol-kachu, Kachur-mukhi, Cauliflower, Cabbage, Bean, Lobey, Radish, All types of leafy vegetables, Other	Carrot, Kochur loti, Okra, Laitta, Puishak, Mustard, Onion, Palm, Soybean
Papaya	Ripe papaya, Green papaya	Green papaya, Ripe papaya
Apple	Apple	Apple, Apple India
Other fruits	Mango, Melon-Bangi, Jack fruit, Leeches, Guava, Pineapple, Safeda, Bedana, Orange, Grape, Black berry, Amra-Kamranga, Others	Lemon, Cocount, Ruhi, Pajam
Sugar	Sugar	Imported sugar, Local sugar
Flour	Flour	Loose flour, Packet flour