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Abstract

Jordan has experienced a substantial influx of refugees from Syria since 2011. The Jordanian government and the international community have expended significant resources to address the urgent humanitarian needs of these refugees and to mitigate negative impacts on the Jordanian population. Although several data sources describe the number and characteristics of Syrians in Jordan, a systematic comparison of the similarities and differences among the data sources has not been made. We seek to fill this gap using several data sources: the Jordan Population Census of 2015, the UNHCR registration database as of 2016, the Ministry of Education Management Information System of 2016/2017, and the Jordan Labor Market Panel Survey of 2016. We examine the number of Syrians in Jordan and their characteristics, including registration status, geographic and age distribution, and children's enrollment status.

Keywords: Refugees, Demographics, Jordan, Syria

JEL Classifications: J15, J61, J11

1. Introduction

Since 2011, over 5.6 million Syrians fled conflict, seeking refuge in neighboring Jordan as well as Turkey, Lebanon and other countries (UNHCR 2018a). By some estimates, Jordan now hosts as many as one Syrian for every five Jordanians. Whatever the precise number, there is broad agreement that the number is large and that their presence has had a profound impact on Jordan, as Syrians rely on Jordanian infrastructure, attend public schools, use other social services, participate in the labor market and impact the markets for housing and food.[6]

Most of the Syrians in Jordan entered through informal border-crossings, so the Jordanian Borders and Residence Department has been unable to identify how many Syrians are in the country. Syrians can register at local police stations,[7] although fewer than 400,000 Syrians have done so. The main governmental source of data on Syrians in Jordan is the Population Census, conducted in December 2015, which enumerated 1,265,514 Syrian individuals. The second main source of data on Syrians is the United Nations High Commissioner for Refugees (UNHCR). The UNHCR provides voluntary registration for asylum seekers, facilitating access to basic assistance and protection. As of 2016, the UNHCR database included 655,344 Syrians actively registered in Jordan (UNHCR 2017).

The Jordanian government, the United Nations, donors, and NGOs have expended significant resources to address the urgent humanitarian needs of these refugees and to mitigate negative impacts on the Jordanian population. As these partner agencies plan their responses, they face uncertainty regarding the number of Syrians in Jordan as well as their geographic location, age profile and other characteristics. The purpose of the present analysis is to examine the variations in estimates of total numbers and to explore if there are any systematic differences among sources in the composition of Syrians in Jordan. The paper uses data from the Jordan Population Censuses of 2004 and 2015, the Jordan Labor Market Panel Survey of 2016 (using two different weighting approaches), the Education Management Information System database of 2016/17, and UNHCR registered refugee statistics from 2016. We examine the number of Syrians in Jordan and their characteristics, including registration status, geographic and age distribution and children's enrollment status.

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[6] The impact on Jordanian citizens from hosting Syrians has been complex. For example, the labor market impact of Syrians on Jordanian workers appears to be net neutral, likely due to increases in both labor supply and labor demand and the long-standing presence of many migrant workers from Egypt and other countries (Fallah, Krafft, and Wahba 2018; Malaeb and Wahba 2018). For further discussion of the effects of the Syrian influx on housing markets see Al-Hawarin, Assaad, and Elsayed (2018) and for further discussion of the effects of the Syrian influx on education of Jordanians see Assaad, Ginn, and Saleh (2018).

[7] The Ministry of the Interior service card, obtained through a police station, serves as proof of legal Jordanian residency in the district where the Syrians register and is used for accessing public services. In order to receive a Ministry of the Interior service card, Syrians must present a Syrian identity document, a health certificate and proof of address. In addition, Syrians entering Jordan after December 2013 must present a UNHCR asylum seeker certificate. Syrians who left the established camps without permission are not eligible to receive cards. It has also been reported that Syrians without national identity documents have had difficulties obtaining the cards. As of the end of August 2016, approximately 363,000 UNHCR-registered Syrians had obtained the Ministry of Interior cards, in addition to 26,565 Syrians who had not registered with UNHCR (Norwegian Refugee Council 2016).

2. Data and analyses

2.1. Data sources

We use four different data sources that have information disaggregated by nationality to examine the number of Syrians in Jordan. These sources include statistics from the United Nations High Commissioner for Refugees (UNHCR) from 2016,[8] the Jordan Labor Market Panel Survey (JLMPS) 2016,[9] tables from the Population and Housing Census (referred to as the Population Census, or Census for short) from 2015,[10] and administrative data on students from the Ministry of Education (MOE)'s Education Management Information System (EMIS) from 2016/17 (referred to as EMIS data). An additional dataset, the Population and Housing Census of 2004, is used to assess how the location of Syrians after the refugee influx compares to the location of Syrians prior to the conflict, when most were economic migrants rather than refugees (Minnesota Population Center 2018).[11]

Particularly given that we are attempting comparisons across the data sources, it is important to note that different statistics on the number of Syrians may result from different universes as well as time frames. The universe for the Population Census is all households in Jordan. The JLMPS 2016 excludes from the Census frame individuals and households living in institutional arrangements, e.g. workers on a work site, university students in a dormitory. The JLMPS 2016 sample does, however, include primary sampling units (PSUs) from the two largest refugee camps, Zaatari and Azraq.

The UNHCR data only includes currently registered refugees,[12] that is, those who are "persons of concern" and have an asylum seeker certificate from UNHCR. Registration is usually given to households and only sometimes just to some individuals within the household (Norwegian Refugee Council 2016). Not all refugees are necessarily registered with UNHCR, either because they did not initially register, or their registration lapsed. Since annual renewal is required, the refugees registered with UNHCR at a particular point in time are those who registered or renewed registration within the past year. The JLMPS also allows us to look at the subset of Syrians who report they are registered. In JLMPS 2016, only non-Jordanians not born in Jordan who were aged 15-59 answer questions about in-migration, including registration.[13] Given the limited age range of individuals who were asked the question, we make the assumption that if one individual in the household is registered, all individuals in the household are registered, in order to compare the number of registered Syrian refugees across sources. The Population Census 2015 tables also include data on registered refugees.[14] The Census 2015 and JLMPS 2016 may capture slightly

[8] Based on publicly available factsheets (UNHCR 2017).
[9] The JLMPS 2016 intentionally oversampled non-Jordanians. See Krafft and Assaad (2018) for more information on the JLMPS 2016.
[10] Tables received from correspondence with the Jordanian Department of Statistics.
[11] We have access to a 10% random sample from the 2004 census. Therefore, we weight every individual by 10.
[12] As much as possible, we avoid using the term "refugee" on its own to avoid ambiguity between registered refugees and Syrians who may have fled conflict but are not necessarily registered.
[13] The specific question asked was "Are you registered as a refugee?"
[14] The Census considered a refugee to be anyone who answered their main reason for coming to Jordan was the lack of security / armed conflict in their country of origin, as well as those who answered yes to the question of whether

more refugees because they ask about registration, broadly, not solely registration with UNHCR. However, as of August 2016, only 7% of Syrians registered with the Ministry of Interior were *not* registered with UNHCR,[15] so the effects of definitional differences should be minimal.

The EMIS data includes only students enrolled in schools, which we can compare with information on students from other sources, such as the JLMPS 2016 and Population Census 2015 tables. We restrict the universe of the analyses to basic and secondary students.[16] In Jordan basic education consists of grades 1-10, and secondary education grades 11 and 12.

In terms of timing, the Population Census of 2015 was conducted in December of 2015 (Jordan Times 2016). The JLMPS 2016 started fielding in December of 2016 and primary fieldwork was completed in April 2017 (Krafft and Assaad 2018). The EMIS data are from the 2016/17 school year. There are thus some differences, of up to a year, across sources. The UNHCR statistics we have include the total number of currently registered refugees in Jordan over time (UNHCR 2018b). Since UNHCR data are available for multiple dates, we use December 31, 2016 data, for individuals who would have registered during 2016, such that the data falls between the Census 2015 and the JLMPS 2016 fielding.

The UNHCR data also allow us to assess trends over time. To the extent that registered Syrian refugees follow the same trend as Syrians in Jordan overall, we note that there has been little change in their numbers from 2015 to 2016 and thereafter. As of November 30, 2015, at the time of the Census, there were 632,228 Syrians registered with UNHCR (UNHCR 2015a). This rose to 655,344 registered Syrian refugees as of December 31, 2016, when JLMPS 2016 was in the field (UNHCR 2017). The latest available numbers, as of October 31, 2018, were 673,193 registered Syrian refugees (UNHCR 2018c). There have been very few new registrations after 2014 (UNHCR 2018c), so most of the increase has been due to new births.

2.2. Weighting of samples

The Census 2015, UNHCR data, and EMIS data are designed to have complete coverage of their universes, and thus are not samples, so no weights are applied to these sources. However, the JLMPS 2016 is both the follow-up to the JLMPS 2010 base wave of a longitudinal study and has a refresher sample; weights are necessary for the data and even provide an avenue for additional investigation of the number of Syrians in Jordan. The JLMPS 2016 used the 2015 Census as its sampling frame for the refresher sample, which over-sampled neighborhoods (*hayy*, Jordan's lowest geographic unit) that the Census identified as having a high proportion of non-Jordanians.[17]

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the individual is considered an asylum seeker. They then asked refugees if they were registered. The exact question was: "Is [name] registered as a refugee in records of government of Jordan or UNHCR?" Response categories were: (1) don't know, (2) unregistered, (3) applied, and (4) registered and has a document (Department of Statistics (Jordan) 2018). We consider only registered and has a document as registered.

[15] Based on the fact that 363,000 UNHCR-registered Syrians had obtained the Ministry of Interior cards, in addition to 26,565 Syrians who had not registered with UNHCR (Norwegian Refugee Council 2016).

[16] While the EMIS data includes kindergarten – 12th grade, we do not include the number of kindergarteners so that our data are comparable to the JLMPS.

[17] All but a handful of the Syrians in the JLMPS 2016 were part of the refresher sample. Differences in the refresher versus baseline sample will therefore not drive results.

A stratified random sample drew neighborhoods as PSUs, stratified by high versus low proportion of households that were non-Jordanian (referred to thereafter as high/low stratum), location (urban, rural, or camp) and governorate.[18] A total of 2,950 additional households (of a planned 3,000) were included in the refresher sample (Krafft and Assaad 2018).

After data were collected, *ex-post* weights were created, whereby the number of households of each nationality (Jordanian, Syrian, Egyptian, other Arab, or other) in each governorate, location, and high/low stratum from the 2015 Census were used to create expansion weights, that is, weights that allow us to expand the number of individuals in the sample up to population level Census estimates.[19] Thus, these weights essentially replicate the 2015 Census results in terms of the number of Syrians. We refer to these weights as *ex-post*.

Although the nationally representative *ex-post* weights are those provided with the JLMPS 2016 data[20] and used in all the subsequent research, the sampling design for the refresher sample does allow us another approach to estimating the number of Syrians in Jordan. The Census was used as a frame to select the number of PSUs and thus households (at 15 households per PSU) drawn from combinations of governorate, location, and high/low stratum. From the number of households sampled in each combination, relative to the number in the Census, we can calculate a probability of a particular combination being sampled. We can use one divided by this probability to create an expansion weight, which we refer to as an *ex-ante* weight.[21] The *ex-ante* weights do still assume the same number of total households as in the 2015 Census in each stratum. While differences between the JLMPS 2016 and other sources may well be due to sampling variability, differences between the JLMPS 2016 *ex-ante* and *ex-post* weights (which use the same sample) can illustrate differences in how and how many Syrians may be captured by household surveys.

2.3. Analyses

Our analyses are primarily descriptive in nature, presenting the number of Syrians by data source (and, in the case of the JLMPS 2016, by weighting scheme). Analyses are presented for three different primary universes: all Syrian individuals, registered Syrians, and Syrian students. The analyses are primarily at the individual level, but we also examine differences in the number of households. We further analyze how the characteristics of Syrians vary by source. A number of our analyses are geographic in nature, to assess whether the variation in number of Syrians relates to their geographic distribution, as well as to illustrate their distribution generally. These analyses

[18] The neighborhoods classified as having a "high" proportion of non-Jordanian households had a proportion of non-Jordanian households that exceeded 46%.

[19] Some minor adjustments were made to winsorize resulting outliers as well as account for situations where a particular group was not sampled (e.g. no Egyptians in the low stratum of a particular governorate rural area). See Krafft and Assaad (2018) for further detail. The resulting numbers are identical to the Census population estimates overall and by nationality at the national level but may vary slightly at lower geographic levels.

[20] Data are publicly available from the Economic Research Forum Open Access Microdata Initiative (OAMDI 2018) at: www.erfdataportal.com

[21] Both the *ex-post* and *ex-ante* weights incorporate PSU level non-response, which was relatively limited (the mean response rate was 98.8% (Krafft and Assaad 2018)).

are both tabular and presented in map form.[22] We primarily examine differences by governorate (the highest level of sub-national geography), but additionally present differences by district (the second level of administrative geography).

When data allow, we compare age and sex distributions across data sources. Since we only have microdata for the JLMPS 2016, only for that data source can we compare labor market outcomes by weighting scheme. When examining students, we further examine their distribution across grades to assess consistency in patterns of enrollment by grade. As an additional set of analyses, we look at the number of *Jordanians* by data source and also the proportion of the population that is Syrian by data source, to understand how differences in other groups may diminish or accentuate differences in the prevalence of Syrians.

3. Results

Our results examine the number of Syrians in Jordan across data sources in several ways. First, we look at all Syrian individuals (section 3.1.1) and then those who are registered (section 3.1.2) by data sources, as well as Syrian students who are enrolled in grades 1-12 (section 3.1.3). Then we examine the Syrians in each data source by characteristics such as geographic distribution by governorate, students by grade level, households, and age and sex (in the form of population pyramids) (section 3.2). Finally, we will look at the number of Jordanians by data sources and the proportion of people who are Syrian (section 3.3).

3.1. Number of Syrians in Jordan

3.1.1. Syrian individuals

We begin by examining the total number of Syrian individuals in Jordan. Table 1 shows the number of Syrians in Jordan by data source (and weighting scheme). The table also presents the number of registered Syrians by data source, discussed in the next sub-section. Focusing on the number of Syrian individuals, the Census finds 1.26 million Syrians, the same as the JLMPS 2016 with *ex-post* weights (by construction). However, with the JLMPS 2016 *ex-ante* weights we estimate that there are around 511 thousand Syrians.[23] The number of Syrians using the *ex-ante* weights from the JLMPS 2016 is less than half the number when using *ex-post* weights. For comparison, the Census 2004 recorded 33,520 Syrians in Jordan.

[22] All of our maps use the STATA package, spmap (Pisati 2018), and geographic shape files downloaded from Integrated Public Use Microdata Series (IPUMS) that are based on the 2004 Jordan Census (Minnesota Population Center 2018).

[23] The unweighted number of Syrians in JLMPS 2016 is 2,900.

Table 1. Number of Syrian individuals, number of registered Syrians, and percentage of Syrians who are registered, by data source

Data	Number of Syrian individuals	Number of registered Syrians	Percentage of Syrians who are registered
UNHCR 2016	-	655,344	-
JLMPS 2016			
Ex-post	1,265,514	1,026,136	81
Ex-ante	510,864	420,618	82
Census 2015	1,265,514	1,014,849	80
Census 2004	33,520	-	-

Source: Based on authors' calculations using JLMPS 2016 (*ex-ante* and *ex-post*) and Census 2004, and tables from Census 2015 and UNHCR 2016.
Notes: "-" denotes data that was not applicable or available.

3.1.2. Registered Syrians

There were 655,344 registered Syrian refugees according to UNHCR 2016 (Table 1). The numbers of registered Syrians are substantially different across sources. Census 2015 and JLMPS 2016 *ex-post* find numbers that are higher than UNHCR but very similar (1.01-1.03 million), while JLMPS *ex-ante* finds a lower number (consistent with the lower number of Syrians overall) of 421 thousand. The percentage of Syrians registered across the JLMPS (both *ex-ante* and *ex-post*) and the Census is quite similar, 80-82%. Although there are substantial differences in numbers, the registration rates are similar across sources. If we use a registration rate of 81% to expand the number of registered Syrians according to UNHCR, we obtain a total number of Syrians in Jordan of about 810 thousand.

3.1.3. Syrian students

Table 2 shows the number of Syrian students in grades 1-12 by data source. According to the JLMPS 2016 *ex-post*, there were 310 thousand Syrians who were enrolled as students in grades 1-12 at the time of the survey. This is similar to the 271 thousand Syrian students recorded by the Census 2015, but much higher than the number of Syrian students found with the *ex-ante* weights from the JLMPS 2016 (138 thousand) and the EMIS 2016/17 (136 thousand). Here, the JLMPS 2016 *ex-ante* and EMIS 2016/17 results are quite similar.

Table 2. Number of Syrian students, grades 1-12, by data source

Data	Number of Syrian students
JLMPS 2016	
Ex-post	309,653
Ex-ante	138,023
EMIS 2016/17	135,630
Census 2015	271,363

Source: Based on authors' calculations using JLMPS 2016 (*ex-ante* and *ex-post*) and EMIS 2016/17 and tables from Census 2015.

These different numbers of students can lead to very different estimates of enrollment rates, depending as well on what denominator is used for the number of school-aged children. Estimates from the JLMPS 2016 *ex-post* (see Sieverding et al. 2018 for details and further discussion) are higher than those found in a national survey in 2014 (Education Sector Working Group 2015) as well as the rates for registered refugees (Brussels II Conference 2018). However, rates are similar to those from surveys of registered Syrian refugees receiving assistance (Abu Hamad et al. 2017; UNHCR 2015b).

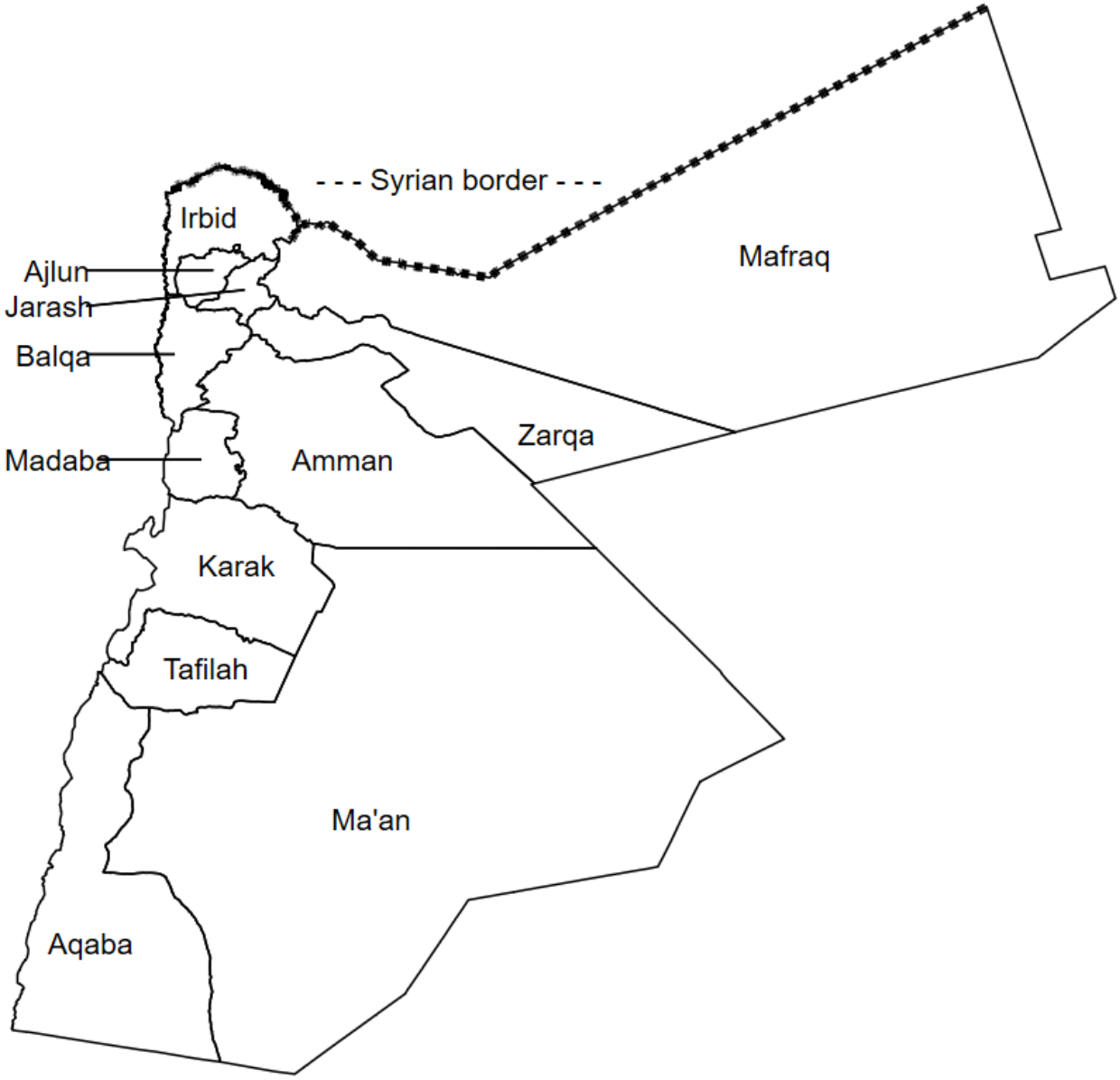
3.2. Variation in characteristics by data source

In this section, we turn to examining whether there are differences in the characteristics of the Syrians we observe in different data sources. If there are systematic differences in, for example, where geographically Syrians are found by different sources, this may suggest reasons why different numbers result. This examination is also informative of whether results on Syrians' characteristics are similar even if there are different estimated numbers, as the rates of registration in Table 1 suggested.

3.2.1. Geographic distribution of Syrians

We begin our examination of differences in characteristics by looking at the geographic distribution of Syrians according to different sources. For reference, Figure 1 shows a labeled map of Jordan's governorates as well as the Syrian border. The governorates of Irbid and Mafraq are along the Syrian border. Amman is the capital and has a large share of the population. Most Syrians in Jordan live in host communities, not refugee camps (Krafft et al. 2018). There are three main refugee camps in Jordan: the largest is Zaatari, in Mafraq, the next largest Azraq, in Zarqa, and the smallest is the Emirati Jordan Camp (EJC), in Zarqa as well (UNHCR 2017). All Syrians in camps are necessarily registered with UNHCR.

Figure 1. Map of governorates in Jordan

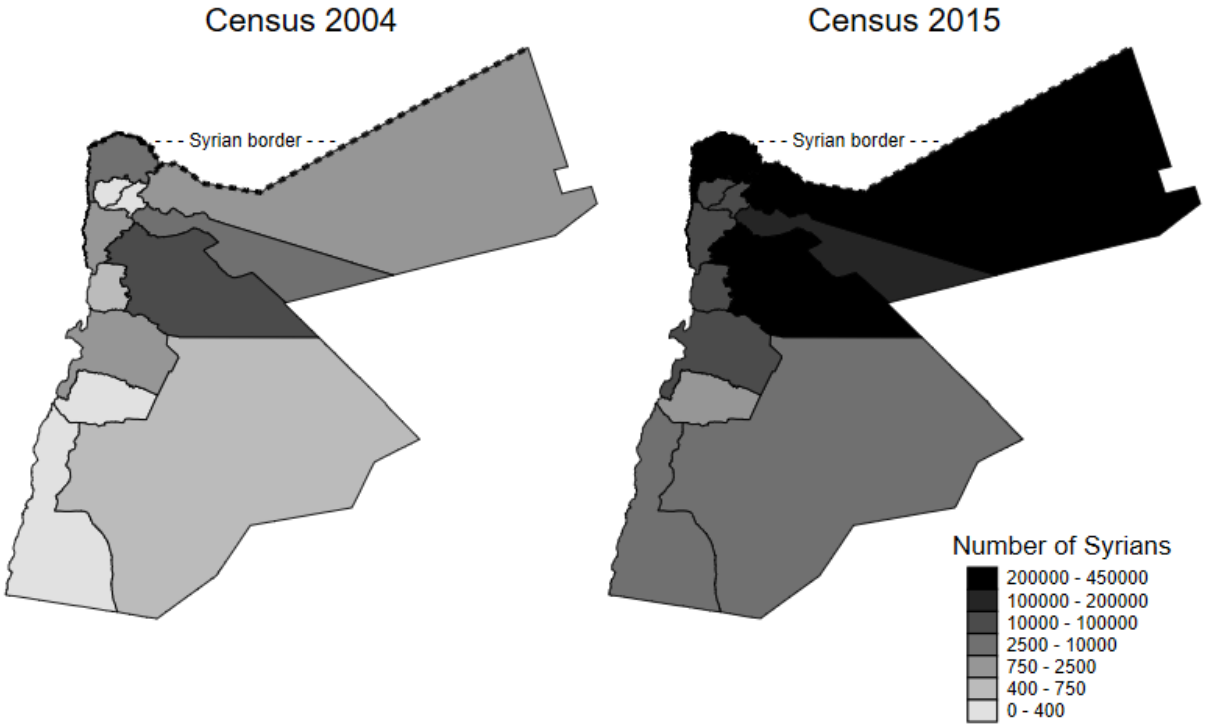


Source: authors' construction based on shapefiles from IPUMS (Minnesota Population Center 2018)

To understand where Syrians are present in Jordan pre- and post-conflict, in Figure 2 we examine the numbers of Syrian individuals in Jordan by governorate for the 2004 and 2015 Censuses (numbers and percentages are shown in Appendix Table 6). For a more geographically nuanced view of the Census 2015, Figure 8, Figure 9 and Table 7 and Table 8 in the Appendix show the number of Syrians in Jordan by district. Figure 2 shows that, historically, more Syrians were in governorates near the Syrian border (two thousand in Mafraq, three thousand each in Irbid and Zarqa) and in Amman (20 thousand, 61% of the Syrians in 2004). These are the same governorates where the Census found most of the Syrians in 2015. According to Census 2015, there were 436 thousand Syrians in Amman (34% of the Syrians in 2015), 343 thousand in Irbid (27% of Syrians),

208 thousand in Mafraq (16%), and 175 thousand in Zarqa (14%). Relatively few Syrians (less than 1-2%) were in other governorates. Based on the two censuses, the percentage of the (total) population in Jordan that was Syrian rose from 0.7% in 2004 to 13.3% in 2016.

Figure 2. Number of Syrian individuals by governorate

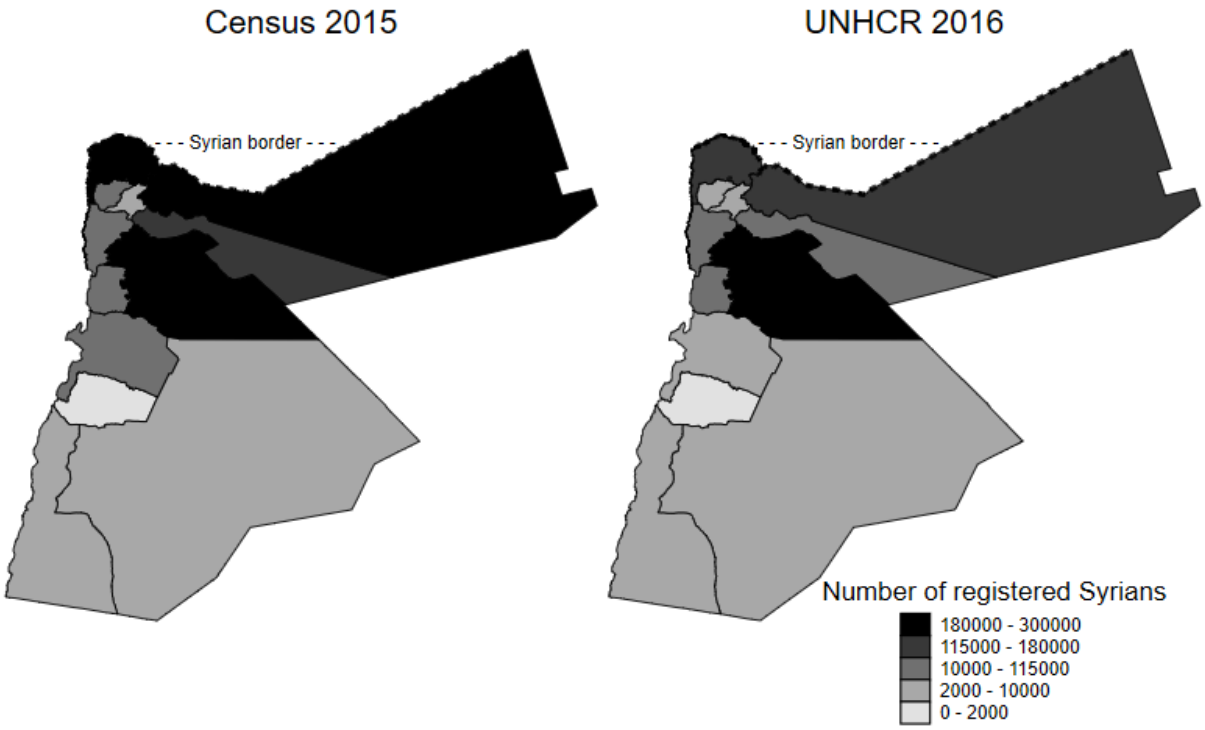


Notes: Number of Syrian individuals by governorates can be found in Appendix Table 6.
Source: Based on authors' calculations using Census 2004 and Census 2015 tables.

Figure 3 explores the number of registered Syrian refugees by governorate, comparing UNHCR 2016 and Census 2015 data.[24] If we take the Census 2015 as Jordan's population and denominator, we can calculate the percentage of the population that is a registered Syrian refugee by source; this is 7% with UNHCR 2016 and 11% with Census 2015. Although the Census 2015 finds more registered Syrian refugees, their geographic distribution is similar; 28% of the registered Syrian refugees in the UNHCR 2016 data are in Amman and that proportion is 29% in Census 2015 data. The largest differences are in Irbid (21% UNHCR, 29% Census) and Mafraq (24% UNHCR, 19% Census). The higher UNHCR share in Mafraq is likely due to the presence of the Zaatari Camp.

[24] We do not undertake geographical comparisons with JLMPS 2016 because it only sampled a few PSUs in some governorates and thus geographic differences are likely to be driven by sampling variability.

Figure 3. Number of registered Syrian refugees by governorate

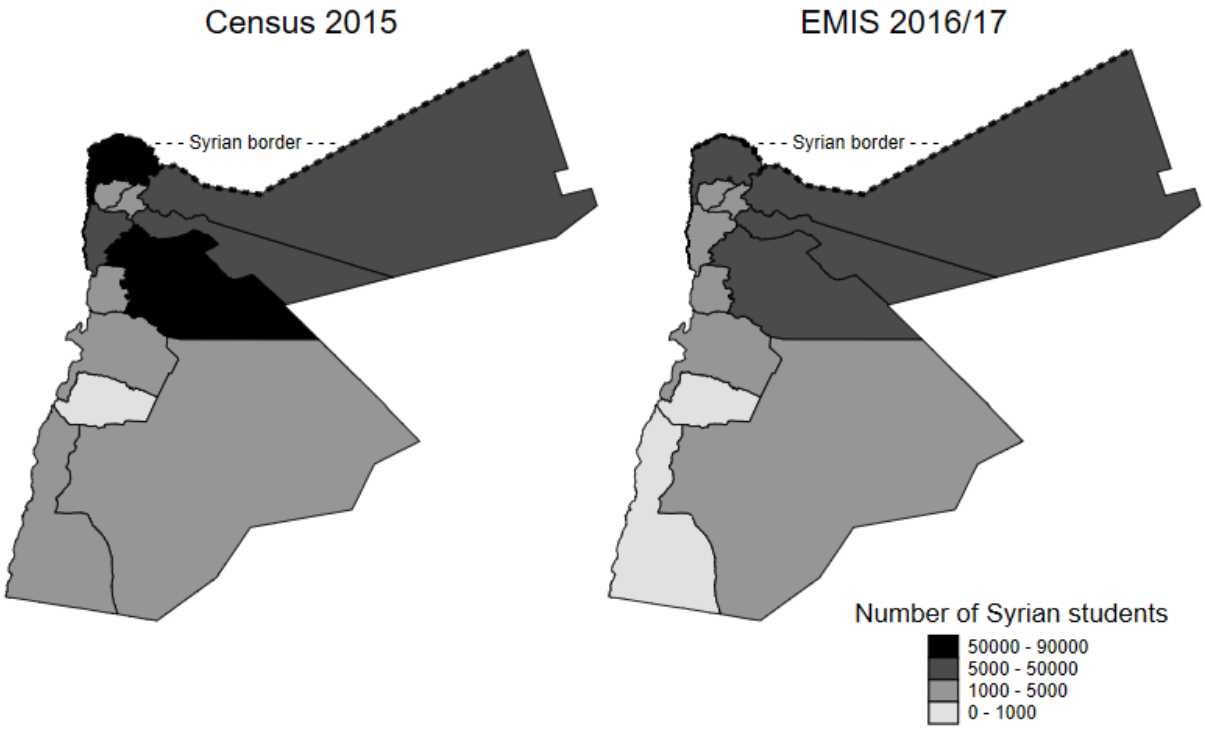


Notes: Number of registered Syrians by governorate can be found in Appendix Table 9.[25]
Source: Based on authors' calculations using Census 2015 tables and UNHCR 2016 tables.

There are some moderate geographical differences in where the EMIS 2016/17 and Census 2015 students in grades 1-12 are located (Figure 4). The Census, which had a larger number of students overall, has relatively more in Amman (88 thousand, 33%) than the EMIS (35 thousand, 26%). The EMIS has a higher percentage in Zarqa (18% vs. 14% for the Census) and Mafraq (25% vs. 15% for the Census) where there are camps. The Census has a higher share in Irbid (31% vs. 22% in EMIS 2016). Numbers in the governorates with fewer Syrian students are generally relatively closer.

[25] UNHCR is missing the governorate code for a small fraction of registered refugees, so they have not been included in our analyses that look at Syrians by governorates.

Figure 4. Number of Syrian students by governorate, grades 1-12



Notes: Number of Syrian students by governorate can be found in Appendix Table 10.
Source: Based on authors' calculations using Census 2015 tables and EMIS 2016/17.

3.2.2. Students by grade

Having found few geographic differences across sources, we now turn to examining other characteristics of Syrians. Table 3 shows the number of Syrian students by grade. Across data sources, differences are smaller in the lower grades and larger for higher grades. The Census 2015 has twice as many Syrian students as the EMIS 2016/17, and the greatest difference by grade level is 4.4 times as many students in the Census in 11th grade. With the JLMPS 2016 as well the most dramatic difference also occurs at 11th grade, however, it must be kept in mind that the JLMPS sample size is relatively small when broken down by grade. The JLMPS 2016 *ex-ante* weighting is the only data source to have fewer Syrian students in some grades in comparison to the EMIS 2016/17 data: 1st grade (ratio=0.5 for JLMPS 2016 *ex-ante*/EMIS), 4th grade (ratio=0.7), 8th grade (ratio=0.5), and 12th grade (ratio=0.7). Yet, in aggregate, JLMPS 2016 *ex-ante* (138 thousand students) is most similar to the EMIS 2016/17 numbers of students (136 thousand students), so these differences may be due to sampling variability in the JLMPS 2016.

Table 3. Number of Syrian students by grade, grades 1-12

Grade	Census 2015	JLMPS 2016 *ex-post*	JLMPS 2016 *ex-ante*	EMIS 2016	Ratio Census 2015/ EMIS 2016	Ratio JLMPS 2016 *ex-post*/ EMIS 2016	Ratio JLMPS 2016 *ex-ante*/ EMIS 2016
1	46,510	32,635	12,720	23,718	2.0	1.4	0.5
2	37,630	39,019	21,331	20,436	1.8	1.9	1.0
3	37,850	39,948	22,689	19,486	1.9	2.1	1.2
4	27,726	35,746	12,485	17,826	1.6	2.0	0.7
5	24,031	40,361	14,521	12,306	2.0	3.3	1.2
6	22,394	26,980	14,446	10,390	2.2	2.6	1.4
7	19,029	18,067	10,161	9,155	2.1	2.0	1.1
8	16,039	12,029	3,303	7,112	2.3	1.7	0.5
9	13,195	28,809	8,504	6,051	2.2	4.8	1.4
10	11,962	15,828	8,283	4,711	2.5	3.4	1.8
11	7,865	12,240	7,700	1,803	4.4	6.8	4.3
12	7,132	7,991	1,878	2,636	2.7	3.0	0.7
Total	271,363	309,653	138,023	135,630	2.0	2.3	1.0

Notes: For JLMPS, the sample size for grade 8 and above is less than 50 with a minimum of 17 in grade 12.
Source: Based on authors' calculations using Census 2015 tables, JLMPS 2016 (*ex-post* and *ex-ante*), and EMIS 2016/17.

3.2.3. Number of Households

One reason that different sources find different numbers of Syrians may be that data are usually collected from households, but definitions of a household and thus household size can vary. Table 4 therefore examines the number of households and household size across data sources. There were 244 thousand Syrian households in Jordan according to Census 2015 and JLMPS 2016 *ex-post* (identical due to the nature of the *ex-post* weights), and 93 thousand according to JLMPS 2016 *ex-ante*. Similarly, the Census 2015 and JLMPS 2016 *ex-post* results showed that 12.6% of households are Syrian, compared to 4.7% from JLMPS 2016 *ex-ante*. The data sources also provide different average household sizes, from 4.4-4.5 people in each household from the JLMPS 2016 (both *ex-ante* and *ex-post*) to 5.2 in the Census 2015. Thus, one of the reasons for different results may be slightly larger household sizes in the Census.

Table 4. Number and percentage of households that are Syrian and average household size, by data source

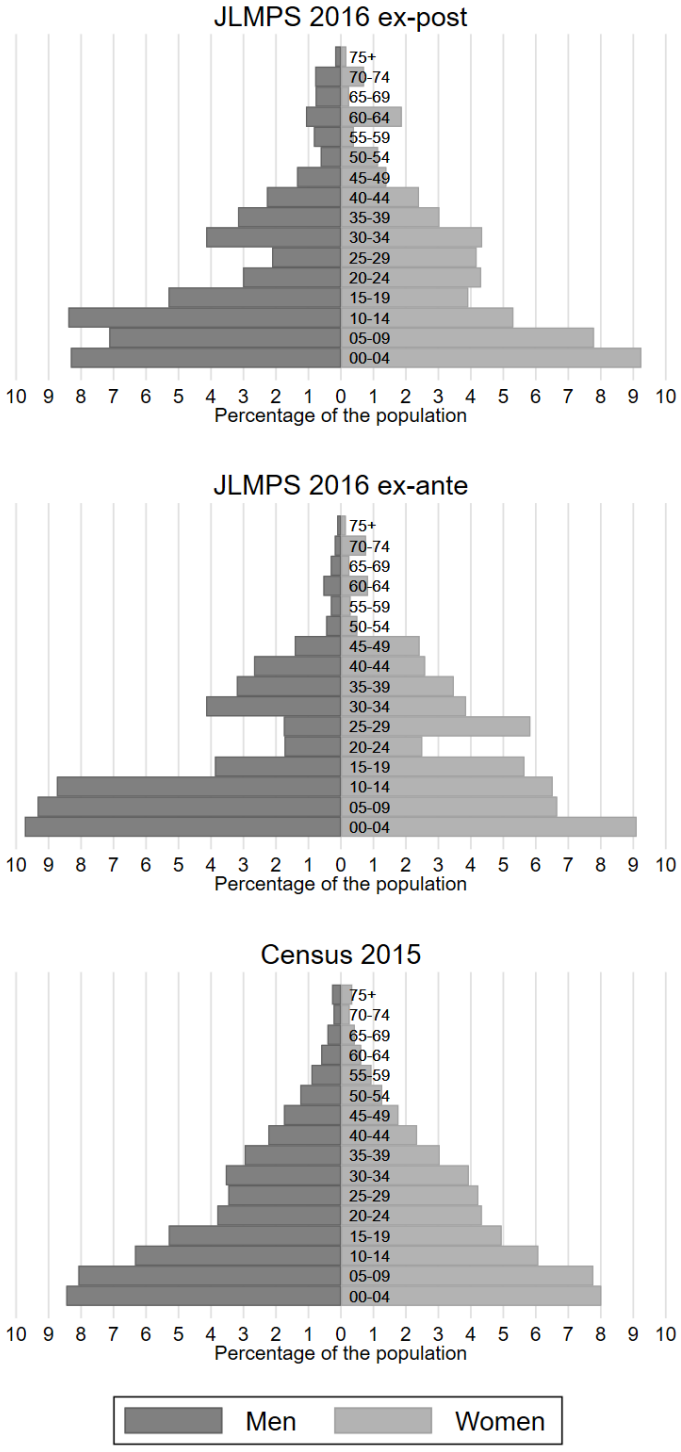
	Census 2015	JLMPS 2016 *ex-post*	JLMPS 2016 *ex-ante*
Number of Syrian households	243,972	243,972	92,769
Percentage of households that are Syrian	12.6	12.6	4.7
Average household size	5.2	4.4	4.5

Sources: Based on authors' calculations using JLMPS 2016 (*ex-ante* and *ex-post*) and Census 2015 tables.

3.2.4. Age and sex: Population pyramids

As a further examination of whether the different sources yield different characteristics as well as different numbers, we now examine the age and sex composition of Syrians in Jordan, in the form of population pyramids. Figure 5 (and Appendix Table 11) shows population pyramids for all Syrians in Jordan according to the Census 2015 and JLMPS 2016 (*ex-ante* and *ex-post*). The JLMPS is necessarily representing the same sample, but with different weighting schemes. The data sources generally show the largest share of the population are young, ages 0-14 (45% in the Census, 46% in JLMPS *ex-post*, 50% in JLMPS *ex-ante*). They differ substantially in terms of the population 15-29. The JLMPS 2016 data show substantially fewer individuals in this range, and particularly fewer men. However, different weighting schemes show some differences in the JLMPS and it must be kept in mind that the underlying sample sizes are modest in a particular sex-age group cell. The data sources are then more consistent again starting at age 30 and up.

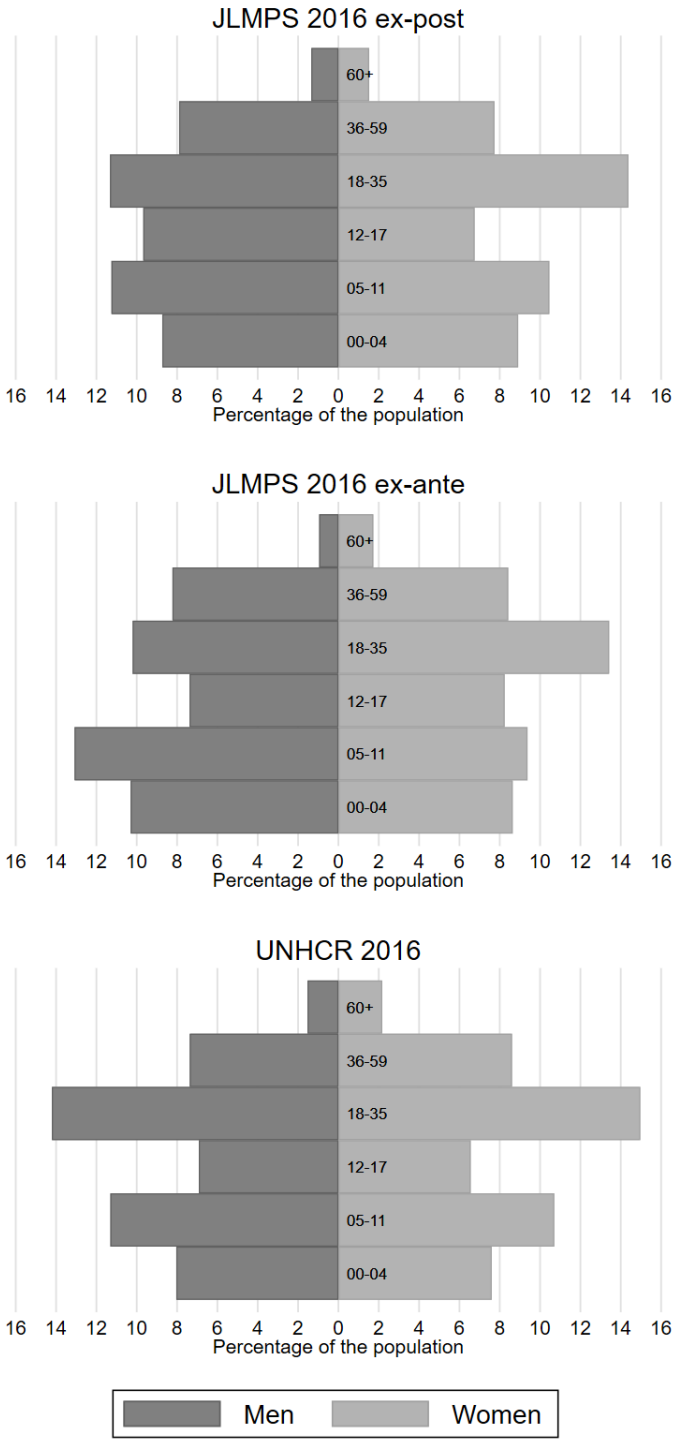
Figure 5. Population pyramids of Syrians (percentage by age group and sex) by data sources



Notes: Percentage of Syrians by sex and age group can be found in Appendix Table 11.
Source: Based on authors' calculations using JLMPS 2016 (*ex-ante* and *ex-post*) and Census 2015 tables.

Figure 6 (and Appendix Table 12) shows population pyramids for registered Syrians in Jordan by data source. To compare with UNHCR we have to use their age groupings of 0-4, 5-11, 12-17, 18-35, 36-59, and 60+. These age groups are not comparable in the number of years they include and thus distort the population pyramids. With the larger clustering of ages, there are fewer differences across the two JLMPS estimates and, overall, a similar pattern emerges from UNHCR 2016 data. However, the UNHCR data do have substantially more 18-35-year-olds (29% vs. 26% for JLMPS *ex-post* and 24% for JLMPS *ex-ante*) and particularly men. It may be that these younger men are more likely to be at work sites or otherwise outside of the JLMPS sampling frame.

Figure 6. Population pyramids of registered Syrians (percentage by age group and sex), by data sources

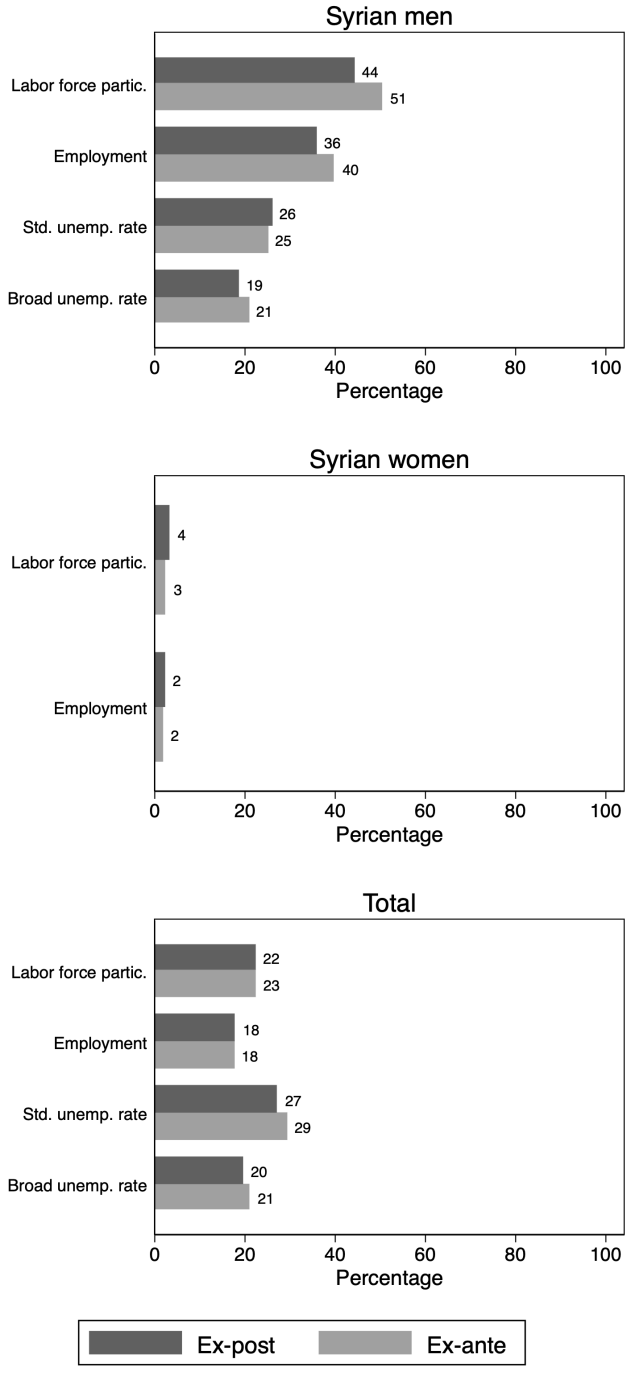


Notes: Percentage of registered Syrians by sex and age group can be found in Appendix Table 12.
Source: Based on authors' calculations using JLMPS 2016 (*ex-ante* and *ex-post*) and UNHCR 2016 tables.

3.2.5. Labor market outcomes

The last characteristics we examine are the labor market outcomes of the Syrians in Jordan (Figure 7). For these we can only use the JLMPS as we do not have microdata or tables on these outcomes for other sources. We specifically examine the labor force participation rate and the employment rate (where the denominator is the Syrian population) as well as the unemployment rate (where the denominator is the Syrian labor force). We focus on the market definition of work, as there is very little subsistence work in Jordan (Assaad, Krafft, and Keo 2018). We examine both the standard (search required) and broad (including discouraged unemployed) definitions of unemployment. The weighting scheme does not lead to substantially different results about participation. *Ex-ante* weights give slightly higher labor force participation for men (44% *ex-post* vs. 51% *ex-ante*) and lower for women (4% *ex-post* vs. 3% *ex-ante*) such that the total is very similar (22% *ex-post* vs. 23% *ex-ante*). Likewise, there are only slight variations in employment rates, 18% overall with either set of weights. Measures of unemployment only are examined for men and the total, since so few women are in the labor force, and are a percentage point higher *ex-post* for the standard definition for men (26% *ex-post* vs. 25% *ex-ante*) but two percentage points lower *ex-post* for the broad definition (19% *ex-post* vs. 21% *ex-ante*). Overall, differences are small, and thus the weighting and underlying numbers do not seem to affect conclusions on the labor force outcomes of Syrians.

Figure 7. Labor market outcomes: Labor force participation rate, employment rate, standard (search required) unemployment rate, and broad unemployment rate (percentages), by sex and weighting, ages 15-64, JLMPS 2016



Source: Based on authors' calculations using JLMPS 2016 (*ex-ante* and *ex-post*).

Notes: All measures use the market definition of employment. Standard unemployment requires search; discouraged employment includes those not actively searching but who are ready and

willing to work. The number of observations in the labor force is too small (N<=30) to report statistics about women's unemployment.

3.3. Number of Jordanians

In parallel to understanding the number of Syrians in Jordan, it is important to note that the number of Jordanians and others (Egyptians, other Arabs, others) across data sources also might vary (Table 5). There are 6.6 million Jordanians in Jordan according to the JLMPS 2016 *ex-post* and the Census 2015, and 8 million Jordanians shown by the JLMPS 2016 *ex-ante*, which is much higher. Recall that the JLMPS *ex-ante* assumes the total number of households from Census 2015, which is likely driving this result. According to the JLMPS 2016 *ex-post* weighting and Census 2015, Syrians make up 13% of the population in Jordan and Jordanians 69%. The JLMPS 2016 *ex-ante* weighting shows that Syrians make up 6% of the population and Jordanians 90%. The *ex-ante* weighting also shows far fewer "other" nationalities (4%) compared to *ex-post* and Census (17%). Thus, the JLMPS may have captured fewer individuals of non-Jordanian nationalities than the Census.[26]

Table 5. Number and percentage of individuals: Syrians, Jordanians, and others

	Number of Syrians	Number of Jordanians	Number of Others	Percentage Syrian	Percentage Jordanian	Percentage Other
JLMPS 2016 *ex-post*	1,265,514	6,613,587	1,652,611	13	69	17
JLMPS 2016 *ex-ante*	510,864	8,043,255	361,891	6	90	4
Census 2015	1,265,514	6,613,587	1,652,611	13	69	17

Source: Based on authors' calculations using JLMPS 2016 (*ex-ante* and *ex-post*) and Census 2015.

4. Discussion and Conclusions

We provide in this paper a systematic comparison of the similarities and differences among available data sources regarding the number and characteristics of the Syrians in Jordan. The total number of Syrians in Jordan varies considerably across data sources. This gap may be at least partially explained by differences in timing and in the populations of interest. The Population Census was conducted in December 2015; the UNHCR registration database as of 2016 was based on a continuous updating over the previous 12 months; the JLMPS was conducted between December of 2016 and April 2017; and the EMIS represents the 2016-2017 school year. It is not uncommon for refugee populations to move frequently and it is possible that a substantial number of Syrians arrived and left Jordan during the periods covered by the data sources.

The populations covered by the data sources also vary. Most importantly, the UNHCR data includes only those who voluntarily registered as asylum seekers, whereas the Population Census was a comprehensive enumeration of all persons in Jordan.[27] It is important to note, however, that

[26] Recall that JLMPS only covers the household population and does not capture populations living in group quarters or work sites, which could be a substantial proportion of migrant workers living in Jordan.

[27] The JLMPS sample was based on the Population Census and included residents of the main refugee camps, but excluded persons living in group quarters or at work sites.

major differences persist even when we consider only registered Syrians. The gap among registered Syrians is only slightly smaller than among non-registered Syrians.[28]

Comparisons of the characteristics of Syrians reveal few systematic differences. We find small differences across sources in the geographic location of Syrians in Jordan. The share of registered Syrians by governorate differs between the UNHCR database and the Population Census and the number of Syrian students differs between the Population Census and the EMIS. However, the differences among data sources show no clear pattern.[29] Similarly, comparisons of employment and unemployment rates between the JLMPS *ex-ante* and JLPMS *ex-post* are consistent.

The most substantial difference we find in characteristics of Syrians exists in the population pyramids shown in Figure 5 and Figure 6. Whereas the Population Census finds a fairly smooth age and sex profile, both the UNHCR database and the JLMPS survey find markedly fewer youth, especially young men. This pattern may be explained by the fact that young men are particularly mobile and may be living on job sites or may have left Jordan.[30]

Whatever the reason behind the variations, it is important to be aware of the substantial differences across data sources and that the choice of data source may have important implications on the conclusions reached by policy makers and researchers. Although administrative data on the number of Syrians students is clear, estimates of the extent of non-enrollment among Syrian youth will vary depending on which population pyramid is used. Similarly, opportunities to increase the number of work permits among Syrian employees will depend on what estimate is used for the number of working-aged Syrians. Further examination of existing data as well as additional surveys can be useful to improve our understanding of the number and characteristics of Syrians in Jordan.

[28] The ratio of Syrians in the JLMPS *ex-ante* estimate to those in the Census was 41% among registered Syrians but only 36% among non-registered Syrians. See Table 1.
[29] See Figure 3 and Figure 4.
[30] Recall that job sites are not included in the JLMPS.

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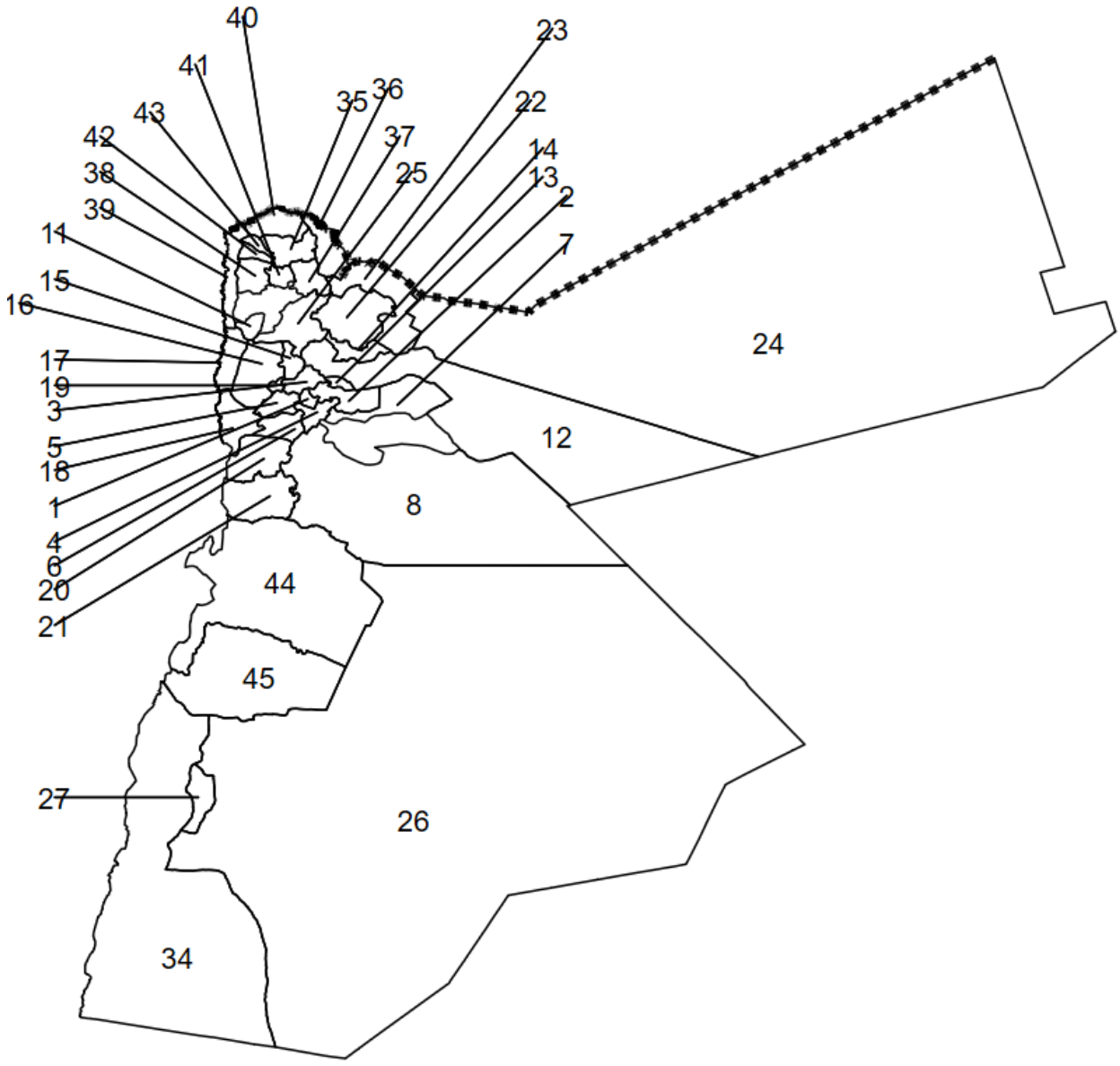
Appendix tables and figures

Table 6. Number and percentage of Syrians in Jordan by governorate

	Number of Syrians		Percentage of the population that is Syrian		Percentage of Syrians	
Governorates	**Census 2004**	**Census 2015**	**Census 2004**	**Census 2015**	**Census 2004**	**Census 2015**
Amman	20,310	435,578	1.1	11	61	34
Balqa	1,560	27,982	0.5	6	5	2
Zarqa	3,330	175,280	0.4	13	10	14
Madaba	500	14,669	0.4	8	1	1
Irbid	2,870	343,479	0.3	19	9	27
Mafraq	2,250	207,903	0.9	38	7	16
Jarash	370	10,868	0.2	5	1	1
Ajloun	210	14,496	0.2	8	1	1
Karak	860	17,077	0.4	5	3	1
Tafileh	330	1,933	0.4	2	1	0
Ma'an	570	8,450	0.6	6	2	1
Aqaba	360	7,799	0.4	4	1	1
Total	33,520	1,265,514	0.7	13.3	100	100

Notes: The numbers in this table are mapped by data source in Figure 2.
Sources: Based on authors' calculations using Census 2004 and Census 2015 tables.

Figure 8. Map of districts in Jordan



Source: authors' construction based on shapefiles from IPUMS (Minnesota Population Center 2018)

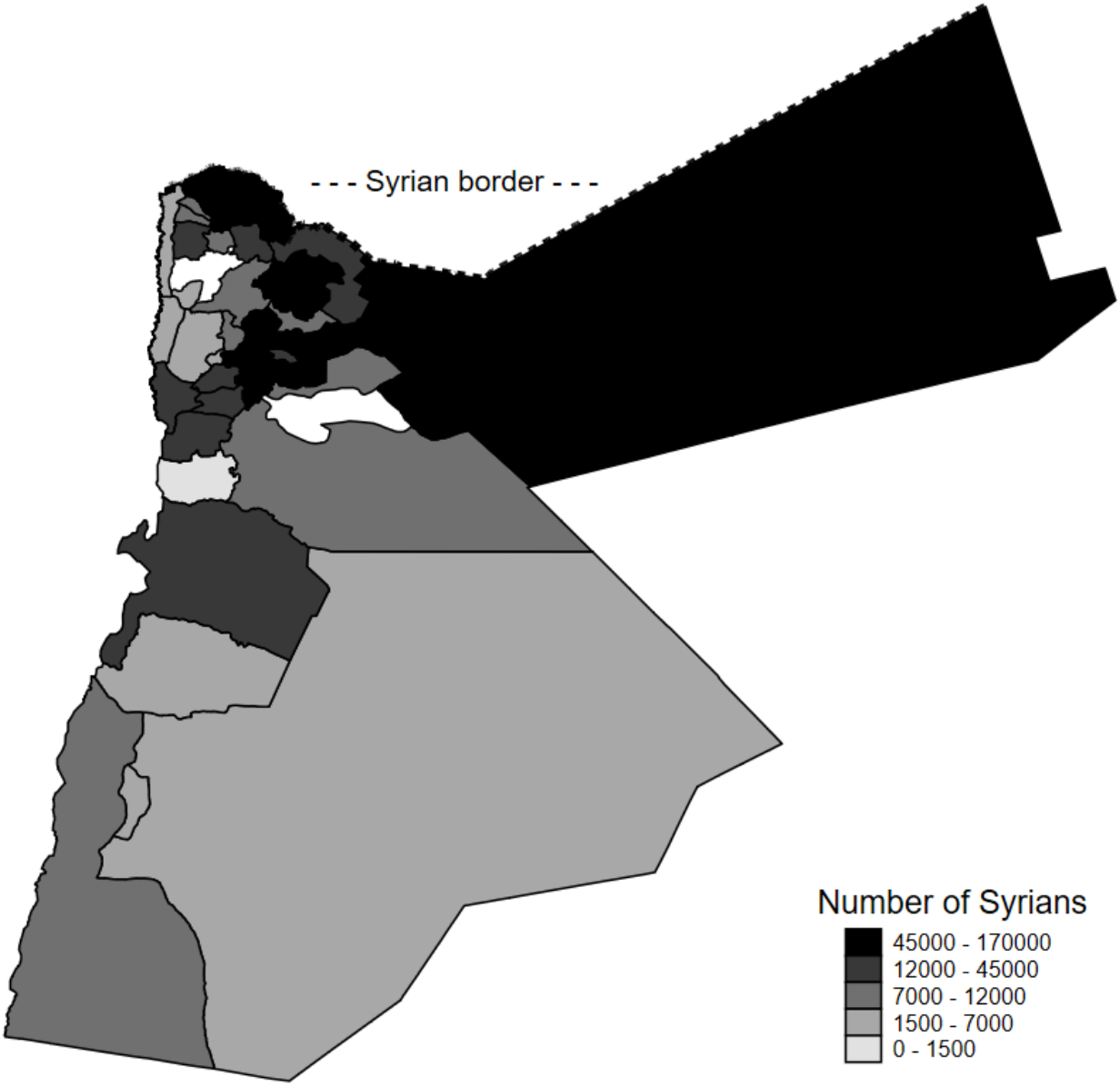
Notes: The corresponding governorate and district names can be found in Table 7. Several districts were combined based primarily on district size.

Table 7. Governorates and districts

Number	Governorate	District
1	Amman	Qasabet Amman
2	Amman	Marka
3	Amman	Jami'ah
4	Amman	Quaismeh
5	Amman	Wadi Essier
6	Amman	Na'oor
7	Amman	Sahab
8	Amman	Jizeh
9	Amman	Mowaqqar
10	Ajloun	Qasabet Ajloun
11	Ajloun	Kofranjah
12	Zarqa	Qasabet Ezzarqa
13	Zarqa	Russeifa
14	Zarqa	Hashemiyyeh
15	Balqa	Ain El-Basha
16	Balqa	Qasabet Essalt
17	Balqa	Dair Alla
18	Balqa	Shooneh Janoobiyyeh
19	Balqa	Mahes and Fohais
20	Madaba	Qasabet Madaba
21	Madaba	Bieban
22	Mafraq	Qasabet El-Mafraq
23	Mafraq	Badiah Shamaliyyeh Gharbiyyeh
24	Mafraq	Badiah Shamaliyyeh, Erwaished
25	Jarash	Qasabet Jarash
26	Ma'an	Qasabet Ma'an, Shoabak, Husseiniyyeh
27	Ma'an	Petra
34	Aqaba	Qasabet El-Aqaba, Quaira
35	Irbid	Qasabet Irbid
36	Irbid	Ramtha
37	Irbid	Bani Ebaid
38	Irbid	Kora
39	Irbid	Aghwar Shamaliyyeh
40	Irbid	Bani Kenanah
41	Irbid	Mazar Shamali
42	Irbid	Tayybeh
43	Irbid	Wasatiyyah
44	Karak	Karak
45	Tafileh	Tafilah

Notes: Several districts were combined based primarily on district size.
Source: These governorates and districts are combined based on the Jordan 2004 shapefiles from IPUMS (Minnesota Population Center 2018).

Figure 9. Number of Syrian individuals by district, Census 2015



Notes: Numbers of Syrians by district can be found in Appendix Table 8.
Sources: Based on authors' calculations using Census 2015.

Table 8. Number and percentage of Syrians by districts, Census 2015

Governorates	Districts	Number of Syrians	Percentage of the population that is Syrian	Percentage of Syrians
Amman	Qasabet Amman	98,343	12	8
Amman	Marka	101,156	11	8
Amman	Jami'ah	46,017	8	4
Amman	Quaismeh	93,695	13	7
Amman	Wadi Essier	41,466	11	3
Amman	Na'oor	28,292	17	2
Amman	Sahab	8,973	8	1
Amman	Jizeh	9,726	12	1
Amman	Mowaqqar	7,910	6	1
Ajloun	Qasabet Ajloun	12,169	9	1
Ajloun	Kofranjah	2,327	6	0
Zarqa	Qasabet Ezzarqa	139,686	17	11
Zarqa	Russeifa	26,255	5	2
Zarqa	Hashemiyyeh	9,339	12	1
Balqa	Ain El-Basha	8,210	5	1
Balqa	Qasabet Essalt	2,528	5	0
Balqa	Dair Alla	1,976	3	0
Balqa	Shooneh Janoobiyyeh	12,860	7	1
Balqa	Mahes and Fohais	2,408	7	0
Madaba	Qasabet Madaba	13,433	9	1
Madaba	Bieban	1,236	3	0
Mafraq	Qasabet El-Mafraq	48,751	25	4
Mafraq	Badiah Shamaliyyeh Gharbiyyeh	14,082	14	1
Mafraq	Badiah Shamaliyyeh, Erwaished	145,070	57	11
Jarash	Qasabet Jarash	10,868	5	1
Ma'an	Qasabet Ma'an, Shoabak, Husseiniyyeh	5,909	7	0
Ma'an	Petra	2,541	5	0
Aqaba	Qasabet El-Aqaba, Quaira	7,799	4	1
Irbid	Qasabet Irbid	165,843	22	13
Irbid	Ramtha	68,306	29	5
Irbid	Bani Ebaid	19,322	12	2
Irbid	Kora	16,324	12	1
Irbid	Aghwar Shamaliyyeh	3,110	3	0
Irbid	Bani Kenanah	48,574	24	4
Irbid	Mazar Shamali	7,258	9	1
Irbid	Tayybeh	7,560	15	1
Irbid	Wasatiyyah	7,182	17	1
Karak	Karak	17,077	5	1
Tafileh	Tafilah	1,933	2	0
Total		1,265,514	13	100

Notes: The numbers in this table are mapped in Appendix Figure 9.
Sources: Based on authors' calculations using Census 2015.

Table 9. Number and percentage of registered Syrians and ratios, by governorate, across data sources

	Number of registered Syrians		Percentage of the population that is registered Syrian		Percentage of registered Syrians		Ratio
Governorates	**UNHCR 2016**	**Census 2015**	**UNHCR 2016**	**Census 2015**	**UNHCR 2016**	**Census 2015**	**UNHCR 2016 / Census 2015**
Amman	180,026	294,993	4	7	28	29	0.6
Balqa	19,147	21,952	4	4	3	2	0.9
Zarqa	109,862	148,294	8	11	17	15	0.7
Madaba	11,024	11,985	6	6	2	1	0.9
Irbid	136,496	299,046	8	17	21	29	0.5
Mafraq	158,739	190,787	29	35	24	19	0.8
Jarash	9,706	9,566	4	4	1	1	1.0
Ajloun	7,930	12,349	5	7	1	1	0.6
Karak	8,704	13,416	3	4	1	1	0.6
Tafileh	1,501	1,259	2	1	0	0	1.2
Ma'an	7,595	6,271	5	4	1	1	1.2
Aqaba	3,372	4,931	2	3	1	0	0.7
Total	654,102	1,014,849	7	11	100	100	0.6

Notes: The numbers in this table are mapped in Figure 3. UNHCR is missing governorate code for a small fraction of registered refugees, so they have not been included in our analyses that look at Syrians by governorates.

Sources: Based on authors' calculations using Census 2015 tables and UNHCR 2016 tables.

Table 10. Number and percentage of Syrian students and ratios, by governorate, across data sources

	Number of Syrian students		Percentage of Syrian students		Ratio
Governorates	**Census 2015**	**EMIS 2016**	**Census 2015**	**EMIS 2016**	**Census 2015/ EMIS 2016**
Amman	88,248	34,831	33	26	2.5
Balqa	5,233	3,592	2	3	1.5
Zarqa	38,263	23,856	14	18	1.6
Madaba	3,279	1,755	1	1	1.9
Irbid	83,929	29,841	31	22	2.8
Mafraq	39,462	34,158	15	25	1.2
Jarash	2,426	1,983	1	1	1.2
Ajloun	3,684	1,739	1	1	2.1
Karak	3,683	1,694	1	1	2.2
Tafileh	373	267	0	0	1.4
Ma'an	1,751	1,291	1	1	1.4
Aqaba	1,032	623	0	0	1.7
Total	271,363	135,630	100	100	2.0

Notes: The numbers in this table are mapped by data source in Figure 4.
Sources: Based on authors' calculations using Census 2015 tables and EMIS 2016/17.

Table 11. Population of Syrians, by sex and age groups (percentage), across data sources

	JLMPS 2016 *ex-post*		JLMPS 2016 *ex-ante*		Census 2015	
Age group	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
0-4	8.3	9.3	9.7	9.1	8.5	8.0
5-9	7.1	7.8	9.3	6.7	8.1	7.8
10-14	8.4	5.3	8.8	6.5	6.3	6.1
15-19	5.3	3.9	3.9	5.7	5.3	5.0
20-24	3.0	4.3	1.7	2.5	3.8	4.3
25-29	2.1	4.2	1.8	5.8	3.5	4.2
30-34	4.2	4.4	4.2	3.9	3.6	3.9
35-39	3.2	3.0	3.2	3.5	3.0	3.0
40-44	2.3	2.4	2.7	2.6	2.2	2.3
45-49	1.4	1.4	1.4	2.4	1.8	1.8
50-54	0.6	1.1	0.5	0.5	1.3	1.3
55-59	0.8	0.4	0.3	0.3	0.9	0.9
60-64	1.1	1.9	0.5	0.8	0.6	0.6
65-69	0.8	0.3	0.3	0.3	0.4	0.4
70-74	0.8	0.7	0.2	0.8	0.2	0.3
75+	0.2	0.2	0.1	0.2	0.3	0.4
Total	49.5	50.5	48.6	51.4	49.7	50.3

Notes: The numbers in this table are shown in the population pyramids in Figure 5.
Sources: Based on authors' calculations using JLMPS 2016 (*ex-ante* and *ex-post*) and Census 2015 tables.

Table 12. Population of registered Syrians, by sex and age groups (percentage), across data sources

	JLMPS 2016 *ex-post*		JLMPS 2016 *ex-ante*		UNHCR 2016	
Age group	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
0-4	8.7	8.9	10.3	8.6	8.0	7.6
5-11	11.3	10.5	13.1	9.4	11.3	10.7
12-17	9.7	6.8	7.4	8.2	6.9	6.6
18-35	11.3	14.4	10.2	13.4	14.2	15.0
36-59	7.9	7.7	8.2	8.4	7.4	8.6
60+	1.3	1.5	1.0	1.7	1.5	2.2
Total	50.2	49.8	50.2	49.8	49.4	50.6

Notes: The numbers in this table are shown in the population pyramids in Figure 6.
Sources: Based on authors' calculations using JLMPS 2016 (*ex-ante* and *ex-post*) and UNHCR 2016 tables.