Christian Hunkler, Aileen Edele & Stefan Schipolowski

The role of educational resources in the labor market integration of refugees: The case of Syrian asylum seekers in Germany

Abstract

The relevance of education for migrants' integration in the labor market is well documented. However, the migration conditions of refugees and their educational resources are different from those of other migrants, as they must often interrupt their educational careers and cannot ensure the suitability of their educational degrees in the receiving country's labor market. It is thus unclear which educational resources refugees have and to what extent these resources are relevant for their labor market integration. This paper examines (a) which educational resources Syrian refugees possess at their arrival in Germany and (b) how their educational resources relate to their labor market integration. We use data on Syrian refugees in Bavaria covering a comprehensive set of indicators for educational resources, including educational degrees and a test of respondents' scientific knowledge. A large proportion (65%) of Syrian refugees report interrupted educational careers. Nevertheless, their educational degrees correspond to their scientific knowledge in a similar way as that observed in a German comparison sample. Educational resources are pivotal in explaining labor market placement. Notably, the scientific knowledge test is found to be a better predictor than educational degrees. We conclude that education and particularly the quality of education, as indicated by the scientific knowledge test, is a notable resource for refugees' labor market integration.

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Die Bedeutung von Bildungsressourcen für die Arbeitsmarktintegration Geflüchteter am Beispiel syrischer Asylsuchender in Deutschland

Zusammenfassung

Die Relevanz von Bildung für die Arbeitsmarktintegration von Migranten ist gut belegt. Die Migrationsbedingungen von Geflüchteten und ihre Bildungsressourcen weichen jedoch von denen anderer Migranten ab, da sie ihre Bildungslaufbahn häufig unterbrechen müssen und die Passung ihrer Abschlüsse für den Arbeitsmarkt des Ziellandes nicht sicherstellen können. Daher ist unklar, mit welchen Bildungsressourcen Geflüchtete ankommen und inwiefern diese Ressourcen ihre Arbeitsmarktintegration begünstigen. Der vorliegende Beitrag untersucht (a) welche Bildungsressourcen syrische Geflüchtete bei ihrer Ankunft in Deutschland besitzen und (b) wie diese Ressourcen mit ihrer Arbeitsmarktintegration zusammenhängen. Als Datengrundlage dienen Angaben syrischer Geflüchteter in Bayern, für die ein umfangreiches Set an Bildungsindikatoren erhoben wurde, unter anderem Bildungsabschlüsse und ein Test naturwissenschaftlichen Wissens. Ein großer Anteil (65%) der Befragten berichtet, ihre Bildungslaufbahn unterbrochen zu haben. Trotzdem sind ihre Bildungsabschlüsse mit dem naturwissenschaftlichen Wissen in ähnlicher Weise assoziiert wie in einer deutschen Vergleichsstichprobe. Multivariate Analysen zeigen zudem, dass Bildungsressourcen auch für Geflüchtete zentral für die Arbeitsmarktplatzierung sind. Beachtenswert ist dabei, dass das naturwissenschaftliche Wissen ein besserer Prädiktor ist als die Bildungsabschlüsse. Folglich stellt Bildung und insbesondere deren Qualität, wie durch den naturwissenschaftlichen Wissenstest indiziert, eine wichtige Ressource für die Arbeitsmarktintegration Geflüchteter dar.

1. Introduction

Push factors of migration such as wars, conflicts and hunger crises have grown in importance relative to pull factors, e.g., labor shortages in receiving countries, making international migration increasingly diverse (De Vroome & Van Tubergen, 2010). Consequently, the movement of asylum seekers and refugees has gained

more relevance compared to the previously dominating labor and family migration (see Massey et al., 1998, p. 13). As the number of refugees worldwide is currently at a record high (UNHCR, 2018), it is a pressing issue to determine factors that facilitate their integration in receiving societies. We understand integration as "the processes that increase the opportunities of immigrants and their descendants to obtain the valued 'stuff' of a society, as well as social acceptance, through participation in major institutions such as the educational and political system and the labor and housing markets" (Alba & Foner, 2015, p. 5).

In this paper, we focus on refugees' placement in the labor market as a key indicator of structural integration. With the term "refugee" we refer to all persons leaving their home countries (mainly) for humanitarian reasons, irrespective of their current legal status. This includes recognized refugees, persons who have been granted asylum, asylum seekers, and persons with temporary suspension of deportation (*Duldung*). While there is extensive research and knowledge on labor and family migrants, less research has addressed the labor market integration of refugees and its determinants (De Vroome & Van Tubergen, 2010). The literature widely agrees that education facilitates immigrants' access to the labor market. However, it is not clear to what degree this also applies to refugees. The aim of the present paper is twofold. We first determine which educational resources the recent cohort of Syrian refugees possesses. To assess refugees' educational resources, we compare them to those of a sample of German residents. The second objective is to advance our knowledge of how refugees' educational resources relate to their labor market integration. Using data from the 'Qualifications, Potentials and Life Courses of Syrian Refugees in Germany' (QPLC) study covering a comprehensive set of indicators for educational resources and interviewing Syrians on average 1.5 years after arrival, we are able to observe the initial stage of Syrian refugees' integration.

1.1 The relevance of education for labor market integration

In line with human capital theory, labor market integration is often conceptualized in terms of an investment decision (e.g., Chiswick & Miller, 2001; Esser, 2006, pp. 39; Kalter & Granato, 2002). Migrants can invest their time and resources into receiving country specific capital and thus integrate into the receiving country's labor market. Alternatively, a migrant may decide to invest into ethnic endeavors, e.g., into economic activities where common ethnicity is advantageous, or to not invest. For the purposes of our research, we simplify this investment decision into a binary choice to invest in the receiving country or not. Such investment decisions generally depend on opportunities, motivation and costs. Perceived opportunities are a necessary condition to invest while the combination of motivation and perceived costs determines individual decisions (for details, see, e.g., Esser, 2006, p. 41–42). Opportunities for labor market integration, i.e., hard restrictions such as work per-

mits, and the perceived likelihood over an investment succeeding, are theoretically connected to age at arrival in the receiving country and education. Human capital theory further suggests the intention to stay and education to affect motivations for labor market integration, i.e., the perceived utility of an investment compared to not investing. The *costs* of an investment are theoretically connected to education. Of course, additional specific conditions can be assumed. Obviously, integration conditions vary between countries and over time, e.g., due to economic conditions or differences in integration policies (e.g., Kogan, 2016). Since we examine refugees from one origin country in one receiving country for the same period, policies should not create variation in the conditions for integration.

Given that education is connected to all three components of the investment decision, it is not surprising that education "appears as a consistent factor associated with positive adaptions" (Berry, 1997). However, the mechanisms linking education to integration are less clear and multifold. Past research suggests at least three mechanisms that connect education and integration. *First*, acquiring educational competencies should develop an individual's problem analysis and problem-solving abilities (e.g., Berry, 1997). It is obvious that these abilities facilitate adaptation to new environments and institutions, including new work environments, by supporting the absorption of new knowledge and improving communication (e.g., Dustmann, 1996). This should increase perceived opportunities for labor market relevant investments specific to the new context. The received education may also involve the acquisition of an additional language, such as English, which may be immediately applicable in the work contexts of the new country. The received education may also involve knowledge on history, values or norms of the new culture (Berry, 1997), which also increases opportunities for integration and lowers costs of investment. The paradigm of social learning proposes similar mechanisms (e.g., Argyle, 1969). According to this reasoning, appropriate behavior in intercultural situations requires social and interpersonal abilities. Rudmin (2009) identifies four ways to acquire such abilities: first, by obtaining information on the new culture, e.g., from media; second, through direct instruction such as via intercultural training; third, by imitation; and fourth from personal support given by mentors familiar with the receiving society. It is obvious that the first two paths will be easier for migrants with more educational resources.

A *second* mechanism explaining the relevance of education for labor market integration are indirect effects of acquired educational competencies. Education influences the acquisition of other resources, e.g., occupational status, and competencies in various domains or social networks, which in turn can foster integration by protecting individuals from adaption stress (Berry, 1997). Another indirect effect occurs via language learning. Educational resources are a crucial determinant of the efficiency of and success with learning a new language (Esser, 2006, p. 109; Schepens, van Hout, & Jaeger, 2020). Obviously, language abilities increase opportunities and reduce costs of integration.

A *third* mechanism through which education could facilitate labor market integration are the signals embedded in educational degrees. Typically, due to differ-

ences in educational systems between countries regarding the length and quality of educational tracks and likely also due to the limited transferability of at least parts of their content, educational degrees acquired abroad are less valued in the labor market than domestic degrees (Friedberg, 2000). There is obviously considerable variation in how much value the receiving country attributes to foreign degrees, likely depending on the type of degree involved and the country it was obtained in. Arguably, in occupations with no specific degree requirements that would require formal recognition, e.g., translators or housekeepers, foreign degrees can still signal that the occupant has relevant human capital, which should facilitate integration. Such signaling effects should be stronger for origin countries with a previous migration history with the receiving country, as employers have (more) experience with employees holding degrees from these origin countries. For Syrian refugees in Germany, there has been very little previous migration from Syria, and hence signaling effects might be limited.

1.2 The special conditions of refugees and the state of research on their integration into the labor market

In line with other scholars, we argue that refugees and labor migrants are merely ideal types on a "continuum of compulsion" (FitzGerald & Arar, 2018, p. 393). Refugees are typically closer to the compulsion pole, which is characterized by limited options. However, migration motives are often multifold; for instance, political and economic reasons do not exclude each other (ibid.). Refugee research should therefore be conducted in close reference to general research on migration and integration (FitzGerald & Arar, 2018; Kogan & Kalter, 2020). However, when applying standard approaches of integration research, we must pay attention to the special conditions of more compulsive movement.

Refugee migration is typically a less planned endeavor, e.g., refugees must often leave their countries on short notice with little control over timing and with little time to prepare and plan for migration (Chiswick & Miller, 2001, p. 394). For young refugees, this often involves abandoning their educational careers (Dryden-Peterson, 2015). Moreover, they typically do not receive formal education or only attend provisional schools during the often extended migration period (UNHCR, 2019; for the case of Syrian refugees, see Crul et al., 2019). Other peculiarities concern often unclear prospects in the new country, e.g., due to conditional and short-term residence permits, which might decrease motivations to integrate into the labor market.

Given these peculiarities, there is no reason to assume that the first two mechanisms connecting educational resources outlined in the previous section operate fundamentally differently for refugees relative to other migrants. Acquired educational competencies should help refugees' integration in the same way as they foster other migrants' integration. However, with regard to the recognition of degrees

and their value in the receiving country's labor market, compared to other migrants, refugees might find their degrees more frequently undervalued. With their lower levels of compulsion, labor migrants can choose to migrate to a country that recognizes their degrees. Moreover, the presumably high prevalence of interrupted educational careers also raises questions regarding whether educational degrees – the standard measure of educational resources – actually capture refugees' educational resources adequately. Instead, refugees' actual knowledge might be a more valid indicator in this population.

Empirical studies typically find that refugees are initially more disadvantaged with respect to labor market integration than other migrants, but in most contexts catch up over time. In the United States, refugees initially worked fewer hours and earned less. Ten years later, however, they outperformed labor migrants in earnings (Cortes, 2004). Similarly, in European OECD countries, refugees' initial employment rate at arrival of 20 percent was almost 50 percent lower than the employment rate of migrants coming to work or study (OECD, 2016, p. 10). However, after 15 years, the gap had narrowed, with more than 70 percent of refugees and slightly more than 80 percent of the comparison group being employed. Similarly, the initial employment rate of male refugees in Germany was markedly lower than that of other male migrants. After ten years, the gap had narrowed, but it still persisted. For females, however, the initial gap between refugees and non-refugee migrants widened over time (Salikutluk, Giesecke, & Kroh, 2016), suggesting that labor market integration varies notably by gender.

1.3 Syrian refugees in Germany

The current study focuses on refugees from Syria. Syria has experienced long-term political and military strife that has produced a large-scale movement of people escaping the civil war. Many of these individuals reached Germany in 2015 and 2016. Syrian refugees form the largest group of asylum seekers in Germany (BAMF, 2019, p. 18), comprising of 27.3 percent of asylum applications submitted in 2018. After the Turkish and Polish populations, they currently constitute the third largest foreign population in Germany (Destatis, 2019). At the end of 2017, an estimated 700,000 Syrians lived in Germany (Worbs, Rother, & Kreienbrink, 2019). Among recent refugees, they show the highest likelihood of receiving the legal right to stay in Germany (*Bleibeperspektive*; BAMF, 2019, p. 38). Compared to other groups of recent asylum seekers, they receive more support from authorities for their integration, e.g., more rapid access to education, employment and administrative help (Seethaler-Wari, 2019).

2. The present study

Our first objective was to determine the educational resources of Syrian refugees. Specifically, we examined the educational degrees Syrian refugees have obtained, at what educational level they studied before migration, and how many of them had to interrupt their education and the knowledge levels they had attained in the sciences. Given the higher likelihood of abrupt and unplanned migration decisions among refugees (see section 1.2), we expect a high share of disrupted educational careers. Moreover, as refugees must presumably often leave their origin countries after receiving most of the educational training required for a degree but without actually having obtained that degree, their educational degrees might differ substantially from their actual acquired competencies. Using a declarative knowledge test for the science domain, we therefore determine which competence levels go along with participants' educational degrees and with the educational levels last attained. We further compare the refugees' declarative knowledge to the knowledge level of German residents to assess Syrian refugees' educational resources in relation to their competitors on the German labor market. As refugees are considerably younger than the German adult population, we additionally compare the refugees' results to those of a subset of the German sample of a similar mean age. This was mainly done because educational expansion or the accumulation of knowledge in the science domain over the life course could have led to an "unfair" comparison. Moreover, knowledge in the science domain has been found to be somewhat more advanced among males (e.g., Schipolowski et al., 2013), although this may depend on the specific item set used in the assessment (Schroeders, Wilhelm, & Olaru, 2016). Since gender differences may blur differences between Syrian refugees and German residents, because the refugee sample includes a much higher percentage of males than the comparison samples, we conducted a gender specific analysis.

Our second objective was to examine how the different indicators of refugees' educational resources relate to their labor market placement. These analyses inform us to what extend theoretical assumptions on the role of education for labor market integration (see section 1.1) also apply to refugees or whether their integration is a special case compared to that of other migrant groups. Given the high likelihood of interrupted educational careers, refugees' degrees may be a less adequate predictor of labor market integration than for other migrant groups. We therefore expected the signaling effect of educational degrees and hence their explanatory power to be limited, whereas the acquired competencies should be closely linked to labor market integration.

As educational resources are obviously not the only relevant condition facilitating labor market integration, we accounted for several migration- and refugee-specific confounders and for gender in our multivariate analyses (Berry, 1997, and Esser, 2006, provide comprehensive reviews of evidence). Relating to conditions specific to all migrants, we control for age at arrival, familial situation, duration of

stay, specific language skills for the receiving country (in our case German), and intentions to stay. As refugee-specific aspects that likely affect labor market integration, we consider residence status, which affects access to the labor market and health, as refugees may face adverse conditions in their home countries that make health problems more likely.

3. Method

3.1 Data, procedure, and participants

3.1.1 Analysis sample

We analyzed data from the Qualifications, Potentials and Life Courses of Syrian Asylum Seekers in Germany (QPLC) project (Khourshed, Hunkler, Méango, & Börsch-Supan, 2019).[1] The QPLC survey covers persons aged 18 and older with Syrian nationality entering Germany starting from 2014 as refugees and living in Bavaria during the survey period (May to December 2017). The study uses multistage weighted random sampling at the regional district/town, housing facility and within facility levels (for details see Khourshed et al., 2019). In total, 275 interviews were conducted with a response rate of 46.8 percent. The realized sample of the QPLC project does not differ substantially in terms of the age, gender and education level of Syrians in Germany relative to German statistics for the national and Bavarian level and relative to the much larger Germany-wide IAB-BAMF-SOEP study of refugees in Germany (Khourshed et al., 2019).

Procedure and Participants. Interviews were conducted using Computer Assisted Personal Interviewing (CAPI) by bilingual interviewers from Syria or neighboring countries. The test assessing declarative knowledge in the sciences was administered in paper and pencil mode. At the time of data collection, individuals in the QPLC sample were 18 to 66 years of age (M = 31, SD = 11) and had been living in Germany for 1.5 years on average. Approximately 87.5 percent of the sample had been in the country for less than two years (the minimum stay to be considered for the survey was two months). Only 24 percent of the sample (n = 63) is female.

Multiple imputation. We used multiple imputation to impute missing values on independent variables to maximize the use of available information and minimize complete case analysis bias (Rubin, 1987).[2] The proportion of missing data is small for most independent variables (see Appendix Table A2). The imputations were

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1   The data analyzed in the present study are available for replications (https://dx.doi. org/10.7802/1955).
2   Independent variables were imputed 25 times using chained equations as implemented in the statistical software package Stata 15.1 SE. Missing values are iteratively replaced using a sequence of univariate imputation methods with fully conditional specifications of prediction equations.

based on all variables used in the multivariate analyses. Additionally, we used a language test score, a variable identifying the sampling points (of the housing facility level), a co-ethnic network indicator and age as auxiliary variables. The dependent variable was not imputed, resulting in the loss of 11 cases. The analysis sample includes 263 cases, i.e., 95.6 percent of all observations.

3.1.2 Comparison sample

To compare the Syrian refugees' knowledge levels with those of the German population, we used a dataset collected by GESIS in 2011 which included a scientific knowledge test partly overlapping with the item set used in the QPLC project (Schipolowski et al., 2013). The sample was obtained using multistage sampling based on an area sampling frame. The target population was the German resident population aged 18 years and older. In total, data were available for 1,134 adults (52 % female) aged 18 to 93 years (*M* = 52, *SD* = 18). Sampling excluded foreign nationals; however, adults with a migration background (and German citizenship) were included. Interviews were conducted using Computer Assisted Personal Interviewing (CAPI), whereas respondents typed in the test answers themselves. For 48 cases, no information on educational levels was available in the data and for four respondents, scientific knowledge test data were missing. Moreover, we excluded 19 respondents with only primary education, as we deemed this group's size too small to analyze. The resulting comparison sample includes 1,063 cases, i.e., 93.7 percent of the available data.

3.2 Measures

Labor market integration. In the QPLC data, participants' *labor market integration* is a binary variable indicating whether a person reports being employed at the time of the interview. Full- and part-time employment and in-company vocational training were set to "1" whereas minimal employment, not working and internships were set to "0."

Educational degree. Participants' *educational degrees* were derived from two questions asking for the highest level completed and the highest level studied at for respondents indicating not having acquired a completion certificate before leaving Syria. For the latter case, we assumed the next lower degree to be the highest degree (or level) completed. These questions were answered with a scale of degrees/levels of the Syrian education system (see Appendix Table A1), which was presented in Arabic. The degrees/levels were subsequently converted into the ISCED 2011 scheme. To avoid studying group sizes too small for our analyses, we combined some categories (see Table A1 for details).

Educational level enrolled in. The level enrolled in was derived from the aforementioned questions asking for the highest level completed and the highest lev-

el studied at. We applied the same ISCED conversion and reduction of categories used for educational degrees.

Education interrupted is a binary indicator for whether participants reported completing their education before leaving their home countries.

Education in the comparison sample. Participants' educational degrees are supplied by the ISCED 1997 coding, which is based on questions about respondents' highest school degree and vocational/tertiary degree. Combining more fine-grained ISCED 2011 categories of the QPLC data allowed for a direct comparison to the less detailed ISCED 1997 coding available in the comparison data. The category "no degree" does not exist for the comparison sample; we removed the 19 respondents with only primary education (see the section on the comparison sample).

Declarative knowledge in the sciences ("scientific knowledge test"). The implemented test was developed through the BEFKI project (Berlin Test of Fluid and Crystallized Intelligence; Wilhelm, Schroeders, & Schipolowski, 2014; Schipolowski et al., 2013). Knowledge in biology, chemistry, geography, physics, medicine, and technology was assessed with 41 multiple choice items. Items were selected based on their psychometric properties as found in previous studies and based on the findings of cognitive interviews with refugees to maximize cultural fairness and adequacy for the target population in terms of content and difficulty (Schipolowski & Edele, 2019). Instructions and items were translated into Arabic and presented in both languages to prevent variance in test scores due to differences in German language proficiency.

The comparison sample completed a different set of items that also covered the science domain. A total of 11 items were employed for both samples and served as linking items, allowing the knowledge scores of the two samples to be placed on the same metric. For this purpose, we scaled the knowledge items of both samples based on the Rasch (1pl) model and estimated weighted likelihood estimates (WLEs) for all participants. We then standardized the scores to $M = 100$ and $SD = 10$ points for the German adult population. As comparisons between refugees and the German comparison sample rely on the assumption of cross-sample measurement invariance, we analyzed uniform differential item functioning (DIF) for the linking items. According to the classification used by the Educational Testing Service (ETS; Zieky, 1993) which is based on the Mantel-Haenszel delta difference statistic (MH D-DIF) and its statistical significance, eight of the linking items exhibited large DIF (MH D-DIF > .64), suggesting that differences between the knowledge scores for the two samples should be interpreted with caution.

Control variables. In the multivariate analyses, we controlled for the following variables: *age at arrival in Germany*; a binary indicator for having one or more children residing with the respondent in Germany; and *duration of stay in Germany* and *German language skills* based on interviewer assessments of whether refugees understood three simple questions and a short conversation in German language. Another indicator was participants' *residence status* distinguishing between (1) full refugee/asylum status as the most long-term and secure status, (2) subsidiary protection, and (3) other status, e.g., the asylum application is still

being processed. Respondents further rated their *health* on a five-point scale from excellent to poor at the time of the interview. *Intention to stay* was assessed using an answering scale with five categories, which were combined for the analyses into: uncertain ("don't know"), short-term ("one year", "a few years", and "until Syria is safe") and long-term ("forever"). We further controlled for gender. Appendix Table A2 shows the distributions of all variables for the unimputed and imputed data.

4. Results

We first examined Syrian refugees' educational resources, and specifically their educational degrees and corresponding competence levels, and compared them to those of the German population (section 4.1). Section 4.2 shows the regression results for the relevance of educational resources for refugees' labor market integration.

4.1 Educational resources of Syrian refugees

The distribution of educational degrees (see Table 1) indicates that a substantial share of 22.8 percent of our sample of Syrian refugees had no school degree, and another 20.5 percent had only completed primary education. In both groups, the majority (76.7% and 72.2%) had started a higher educational level, but had not completed it. Moreover, 22.1 percent of the sample had completed lower secondary education; of these, more than one in three persons (36.2%) were enrolled in a higher educational level before leaving Syria, but did not complete it. Another 22.4 percent received upper or postsecondary level degrees. Only a small proportion of this group held vocational secondary degrees comparable to German (dual) vocational education programs, 2.7 percent had completed vocational track secondary degrees, and 1.9 percent held certified assistant certificates from technical institute programs. Finally, 11.4 percent had obtained tertiary degrees ranging from bachelor to doctoral degrees.

The share of Syrians reporting having to interrupt their education to leave the country is substantial, representing approximately 70 percent across all degree levels except for those holding tertiary degrees, only 40 percent of whom indicated an interruption of their education. Given limited opportunities to gain higher educational degrees in this group, especially for those holding masters and PhDs, this is not surprising. It is noteworthy, however, that 67 percent of those without a school degree reported having had to interrupt their education. All of these persons were 18 years or older, which casts doubt regarding whether all of them would actually have completed an educational degree if they had not left their countries. However, the share corresponds to the share of persons reporting being enrolled at a higher educational level.

Table 1:   Educational degrees and enrollment of Syrian refugees

Educational Degree	n	%	Female %	Age Mean	Were enrolled at a higher level %	Interrupted education to leave country %
No degree	60	22.8	28.3	34.5	76.7	67.3
Primary	54	20.5	22.2	27.7	72.2	70.4
Lower secondary	58	22.1	27.6	30.0	36.2	69.0
Upper/postsecondary	59	22.4	18.6	29.7	11.9	67.8
Tertiary	30	11.4	16.7	32.4	[a]	40.0
Information missing	2	0.8	100.0	46.2	-	-
Total	263	100.0	24.0	30.9	43.3	65.2

Notes. Unweighted and unimputed data. [a] As the "were enrolled at a higher level" measure does not distinguish among the broad degree categories listed under column 1, the share enrolled at a higher level for tertiary degrees is not defined.

Table 1 further suggests gender and age differences with regard to educational degrees. Women were apparently overrepresented in the groups with no or low educational degrees and underrepresented in the more educated groups. However, these differences are not statistically significant (Pearson chi2(5) = 9.28, p = 0.10; Fisher's exact p = 0.16), probably due to the small number of female respondents. Regarding age, respondents with no degree were significantly older than respondents with primary or secondary degrees (all two-sided t-tests with p < 0.05).

We used the declarative scientific knowledge test to analyze the competence levels corresponding to the respective educational degrees. This approach allowed us to assess whether the information given by the respondents regarding their Syrian degrees reasonably corresponds to their actual competencies. We also compared the competence levels of the Syrian sample to that of a population of adults predominantly graduating from the German education system. As the studied refugees are considerably younger than the German adult population, we also compared the refugees' results to those of a subset of the German sample of a similar mean age. Note that the DIF analyses presented above suggest that the test might not be perfectly comparable between the two samples. Nonetheless, the comparison allows to approximately estimating the actual group differences in scientific knowledge. Figure 1a shows the overall distributions of the three samples.[3]

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3   All figures were computed using the ggplot2 package developed by Haley Wickham et al. with RStudio Version 1.2.5033.

Figure 1: Test distributions of declarative knowledge in the sciences for Syrian refugees and the German comparison samples
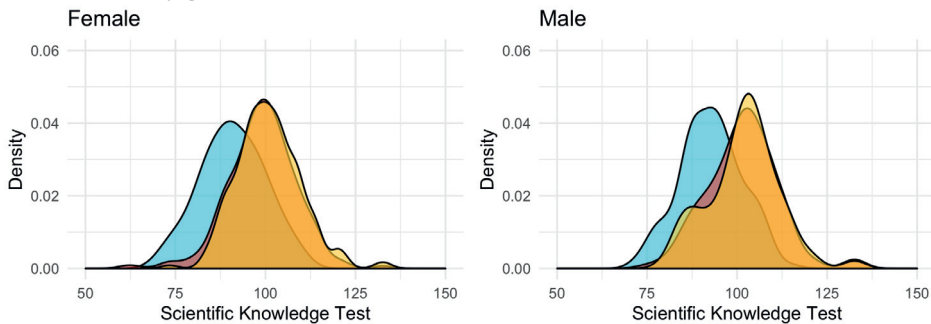
a. Total sample
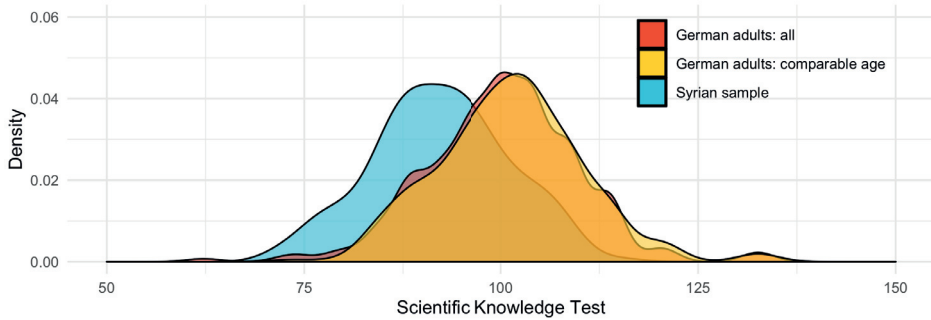
b. Test scores by gender

Figure 1. Syrian sample aged 18 to 58 with a mean age of 30.3 years, *n* = 205 (non-imputed data); German sample of comparable age: aged 18 to 43 with a mean age of 30.6 years, *n* = 319; German sample: aged 18 to 93 with a mean age of 53.3 years, *n* = 1,063.

Overall, the Syrian refugee sample shows considerably less declarative knowledge in the sciences than the German sample of comparable age and the overall German sample. Their mean on the scientific knowledge test is approximately 0.8 standard deviation units lower than both comparison samples (Table 2). This was expected, given the considerable share of Syrian refugees only completing primary education or less. The standard deviation is also smaller for Syrians relative to both German samples. The distributions shown in Figure 1a indicate that this is mostly due to some Germans scoring very high and very low on the science knowledge test, whereas the Syrian distribution shows fewer extreme manifestations. Figure 1a also shows that the distributions of the two comparative German samples are very similar. Therefore, in most analyses presented below, we only use the total German sample for comparisons.

Figure 1b divides the test distributions by gender. Figure 1b shows slightly higher scores for Syrian and German males. The male scores are however only between

0.9 and 2.5 points higher and the difference is only significant in the total German sample.

Table 2:   Declarative knowledge in the sciences for Syrian refugees and the German comparison samples by educational degree level

| ISCED degree | Science knowledge test | | | | | |
| | Syrians | | German adults: comparable age | | German adults: all | |
	M	SD	M	SD	M	SD
No degree	84.5	6.2	-	-	-	-
Primary	89.5	8.6	-	-	-	-
Lower secondary	92.6	7.5	96.4	8.8	94.7	10.1
Upper/postsecondary	94.7	8.3	100.9	9.2	99.2	9.2
Tertiary	98.2	7.3	105.4	8.2	104.6	8.8
Total	92.3	8.7	101.2	9.3	100.2	9.7

Notes. Syrians aged 18 to 58 with a mean age of 30.3 years, n = 205 (non-imputed data); German sample of comparable age: aged 18 to 43 with a mean age of 30.6 years, n = 319; German sample: aged 18 to 93 with a mean age of 53.3 years, n = 1,063. Means and standard deviations for the total German sample slightly deviate from M = 100 and SD = 10 due to the exclusion of some cases (see section 3.1.2).

Next, we investigated how the scientific knowledge test scores correspond with the respective Syrian educational degrees. Figure 2a presents a clear sequence of increasingly higher levels of declarative knowledge with degree levels (for means and standard deviations, see Table 2).[4] However, the distributions of the scientific knowledge test scores across the Syrian degrees heavily overlap.

The test score distributions for different German degrees also overlap to a considerable extent and in a similar fashion as for the Syrian sample (see Figure 2b). Furthermore, the test score distribution of Germans with a lower secondary degree has a long tail towards low competencies. Considering the higher standard deviations found at all degree levels for the German sample (Table 2), Syrian degrees may unexpectedly allow more precise inferences on actual competencies than German degrees.
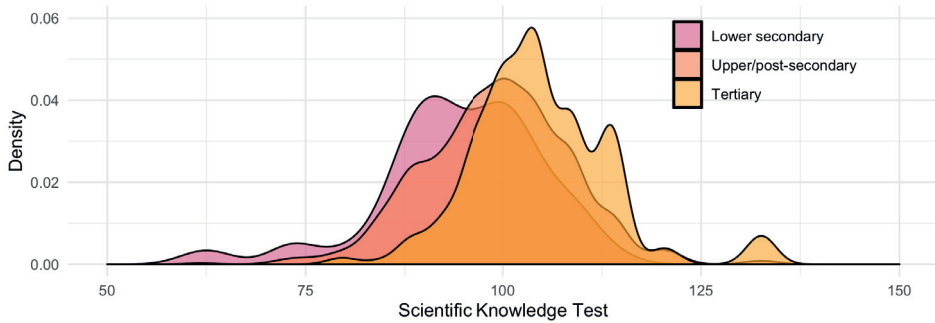
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4   In additional analyses we compared those studying at a higher level without completion to those who had not. The differences within degree levels are less than 2 points and not significant.

Figure 2: Declarative knowledge in the sciences for Syrian refugees and all German adults by educational degree level

a. Syrian sample
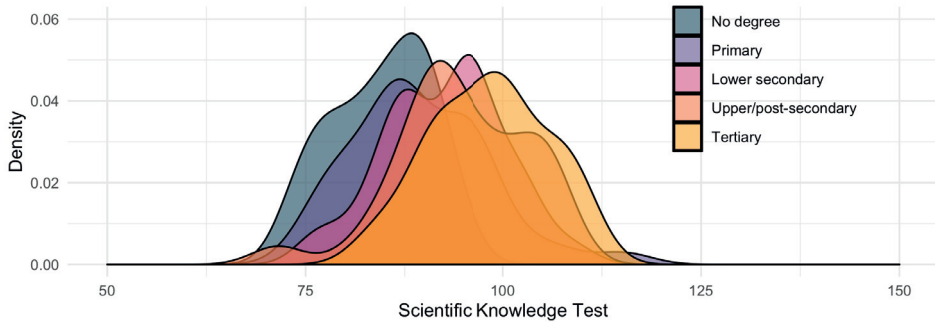
b. Total German sample

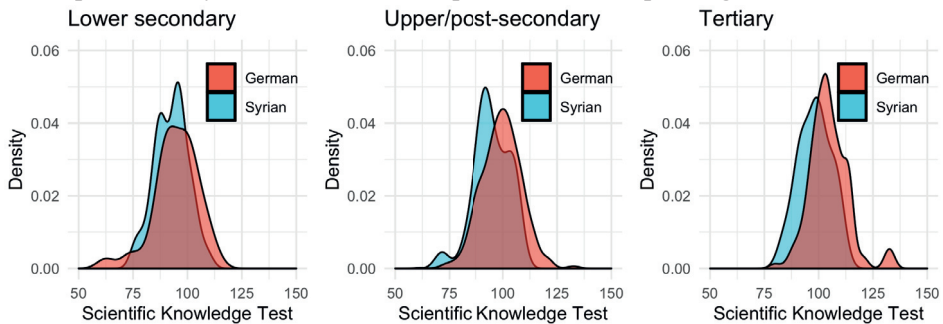c. Comparison of Syrian and German samples within corresponding educational levels

Figure 2. Panel a. non-imputed Syrian sample (*n* = 205, QPLC data). *Panel b.* German sample, *n*= 1,063; "Lower secondary" refers to persons with a lower secondary degree (*Hauptschulabschluss* or *Realschulabschluss*) and with no vocational or tertiary degree (*n* = 111, 10.4%); "upper/postsecondary" are typically persons with lower secondary school degrees completing (dual) vocational training (*n* = 673, 63.3%); persons with "tertiary" degrees have a *Fachschulausbildung* or typically a university or university of applied sciences degree, e.g., Bachelor, Master, and PhD (*n* = 279, 26.3%). *Panel c.* test score distributions for Syrians and Germans within the same educational level.

In comparing the test distributions of Syrians and Germans within corresponding educational degree levels (Figure 2c), we found that within upper and postsecondary degrees and tertiary degrees, the mean competence level for the respective Syrian degree is slightly lower than for the corresponding German degree. However, the overlap of distributions within all three levels is very high. Thus, the substantial overall difference in the competencies displayed in Figure 1 is apparently mostly attributable to Syrians with no educational degree or with primary degrees.

4.2 The relevance of educational resources for labor market integration

Table 3 shows unstandardized coefficients from linear probability models determining the explanatory power of educational resources for Syrian refugees' labor marked integration.[5] The effects of the predictors can be interpreted as the percentage change in the likelihood of being employed. Model 1 only includes the educational degree and the indicator for an interrupted educational career as predictors. Compared to not having a degree, holding a primary and tertiary degree increases the likelihood of employment or being in training. In contrast, the chances of Syrians with lower secondary and upper/postsecondary education being employed does not significantly differ from those without an educational degree. The latter is not surprising given the high relevance of vocational degrees in Germany and how few Syrians have equivalent postsecondary vocational degrees (see above). The unexpected positive effect found for those with primary education may also be caused by correlations with the control variables (see below).

Unexpectedly, the indicator for interrupted educational careers did not predict employment. We expected receiving more schooling than the completed degree to foster employment. In additional analyses (not shown), we tested whether this was the case for specific degree levels. To this end, we added interaction terms of educational degrees and the interrupted education variable to the model. We also tested interactions of educational level with enrollment at a higher educational level. Neither specification significantly improved the model.

Adding the scientific knowledge test scores as predictors of employment (Table 3, Model 2) diminished the coefficients of educational degrees. The test scores significantly predicted labor market integration and the explained variance increased, though to a still limited degree.

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5   Regressions were estimated using Stata 15.1 SE.

Table 3: Unstandardized coefficients from linear probability models estimating Syrian refugees' labor market integration by educational degree, scientific knowledge and control variables

	Model 1	Model 2	Model 3	Model 4
Education degree (Ref.: No degree)				
Primary	0.076**	0.045	0.031	0.008
	(0.035)	(0.039)	(0.036)	(0.038)
Lower secondary	0.052	0.005	0.032	-0.003
	(0.044)	(0.052)	(0.053)	(0.058)
Upper/postsecondary	0.034	-0.023	0.019	-0.027
	(0.050)	(0.066)	(0.047)	(0.063)
Tertiary	0.207**	0.132	0.163*	0.108
	(0.097)	(0.107)	(0.089)	(0.098)
Education interrupted	0.026	0.029	0.027	0.026
	(0.047)	(0.047)	(0.045)	(0.045)
Science knowledge test		0.005**		0.004*
		(0.002)		(0.002)
Female			-0.040	-0.039
			(0.045)	(0.043)
Age at arrival in Germany			0.001	0.001
			(0.002)	(0.002)
Child(ren) in DE: 1 or more			-0.016	-0.017
			(0.043)	(0.044)
Duration of stay in Germany (years)			0.012	0.014
			(0.025)	(0.025)
German language skills (Interviewer assessments)			0.009	0.004
			(0.014)	(0.014)
Residence status (Ref.: other)				
Subsidiary protection			0.013	0.031
			(0.052)	(0.052)
Full refugee/asylum status			0.050	0.065
			(0.061)	(0.062)
Health (Self-assessed)			0.027	0.021
			(0.017)	(0.016)
Intention to stay (Ref.: Uncertain)				
Short-term			0.116**	0.106**
			(0.045)	(0.042)
Long-term			0.016	0.014
			(0.044)	(0.045)
Constant	0.016	-0.400**	-0.170	-0.480**
	(0.055)	(0.181)	(0.109)	(0.184)
n	263	263	263	263
R²	4.18	6.19	9.38	10.60
Adjusted R²	2.31	3.98	3.87	4.77

Notes. Based on multiple imputed data with clustered (sample point) standard errors shown in parentheses. * $p < .10$, ** $p < .05$, and *** $p < .01$, two-tailed.

Models 3 and 4 add the other conditions relevant for labor market integration to both equations used above. Adding these control variables did not substantially change the pattern of the results. Respondents with a tertiary education were still advantaged compared to respondents without a degree and educational interruptions did not predict labor market integration. The statistical effect of primary degree vs. no degree failed to reach significance in Model 3, suggesting that the effect of this educational level shown in Model 1 may be driven by other factors. The significant positive effect of the science knowledge test, in contrast, remained almost unchanged. A comparison of the models indicates that scientific knowledge contributes the most to the explained variance by far. Note that the explained variance is of 4 to 5 percent and thus not very high. In further robustness checks (available from the authors), we also included indicators for socioeconomic status, socioeconomic background and social capital, and the results remained largely unchanged.

While most control variables did not predict employment, Models 3 and 4 indicate that the intention to stay relates significantly to labor market integration. This resulting pattern suggests that those with short-term intentions integrate into the labor market significantly faster than persons with long-term or unsecure prospects of staying. This is an unexpected finding, as we would have expected those with long-term prospects to be most motivated to integrate. It may be that those with long-term prospects invest in language abilities and educational upgrading first. Other analyses of these data (see Hunkler & Khourshed, 2020), however, refute this reasoning. Alternatively, refugees' intentions to stay may not coincide with their expectation to actually be allowed to stay, and the latter may thus play a more central role in their labor market integration. They may thus show a larger discrepancy between the intention to stay used here and the expected length of stay.

5. Summary and conclusions

This paper examined Syrian refugees' educational resources and how these resources relate to their integration into the labor market. The analyzed dataset offers unique potential to answer these questions, as it includes an exceptional set of indicators of participants' educational resources, including educational interruptions, educational degrees, the highest level studied at and a test of declarative knowledge in the sciences.

The majority of Syrian refugees in the sample reported not having finished their education before leaving their home countries. A substantial share of participants reporting studying at a higher educational level than that of the degree they hold corroborates this finding and highlights that Syrian refugees must often interrupt their educational careers. Educational interruptions and leaving the school system without completing a degree of the last-attended educational level were not uncommon in Syria in precrises times (see Gebel, 2012). However, the war most likely aggravated this phenomenon, leaving interrupted educational careers particularly prevalent in the Syrian refugee population.

Educational interruptions are likely to account at least partially for the high proportion of Syrian refugees with low levels of education. In sum, over half of the sample has not attained the degree level typically expected on the German labor market, i.e., an upper or postsecondary degree, signaling a high demand for further qualifications. At the same time, a substantial proportion of Syrian refugees is highly qualified and possesses upper or postsecondary (22%) or tertiary (11%) degrees.

We further found the average knowledge level of Syrian refugees in the sciences to be higher the higher the school degree attained. However, those studying at a higher educational level without completing it did not score significantly higher in the scientific knowledge test than those with the same degree who that had not studied at a higher educational level. This indicates that the Syrian degrees reported in this study quite adequately reflect the actual educational resources that the participants have acquired. This finding substantiates results of the IAB-BAMF-SOEP study of refugees in Germany finding refugees' educational degrees to be positively related to their perceptual speed, a marker of a person's cognitive potential (Schupp et al., 2018). However, perceptual speed has less predictive validity for labor market integration (Evans, Floyd, McGrew, & Leforgee, 2002; Taub, Floyd, Keith, & McGrew, 2008) and is less closely linked to education (Salthouse, 1996). Comprehensive assessments of declarative knowledge are, in contrast, among the best predictors of educational and labor market success (e.g., Dye, Reck, & McDaniel, 1993; McGrew & Hessler, 1995; Ones, Viswesvaran, & Dilchert, 2005), as they are to a large degree the result of educational processes and hence a very direct indicator of educational resources. Knowledge tests such as the instrument used in this study are hence better suited to determine the validity of educational degrees.

Given that many Syrian refugees do not hold a secondary degree, it is not surprising that they on average attained lower knowledge levels than the comparison samples, who were predominantly educated in Germany where not completing secondary school is very uncommon. In comparing Syrian refugees and Germans with the same level of formal education, we find the mean scores of Syrians to be roughly half a standard deviation lower. Nevertheless, the distributions overlap considerably. Thus, while similar educational levels obtained in Syria on average correspond to somewhat lower knowledge levels than the corresponding German degrees, a considerable proportion of the Syrian sample keeps up with the German-educated comparison group. The lower level of educational resources overall and to a smaller extent within comparable degrees is in line with the results of large scale performance assessments such as TIMSS 2011 placing Syrian students far below the international median, e.g., in science (Martin et al., 2012, p. 114) or mathematics (Mullis et al., 2012, p. 114). In contrast, German students are typically above the international mean in mathematics (Selter et al., 2016) and science (Steffensky et al., 2016).

Regarding the relationship between educational resources and labor market integration, we find educational resources to be a meaningful predictor of labor mar-

ket placement. Educational resources explain roughly five percent of the variance in employment. The fact that the average duration of stay in the sample is just 1.5 years leads us to believe that the effect has not yet fully played out. Notably, the science knowledge test was found to be a better predictor than educational degrees. This indicates that specifically the quality of education, as indicated by the science knowledge test, is a major resource for refugees' labor market integration. While our study cannot clearly identify the mechanism through which education translates into labor market success, this finding is in line with the notion that Syrian degrees have limited signaling value.

Our study is not without limitations. First, the study only captures one knowledge domain, that is, science and technology, which is a better indicator than those considered in previous studies (see above), but not a comprehensive indicator for educational resources overall. However, as other subject domains such as languages or social sciences are very specific to the respective curriculum, the sciences are, next to mathematics, the only domain for which knowledge is roughly comparable across curricula and cultures. Second, the test scores for the two samples are not perfectly comparable as indicated by DIF analyses of the items presented to both samples. However, we are not aware of any data allowing for a better comparison of competences between adult refugees and the German general population. The comparisons made here are based on sufficiently similar and thoroughly constructed tests, so that despite its limitations, we deem the findings informative. Third, the sample size of the QPLC is comparatively small and was sampled from a single federal state. However, given the quota distribution of refugees across Germany, there are no reasons to expect different results for a national sample. Fourth, the QPLC data pertain to Syrian refugees living in Germany for 1.5 years on average, and only a small proportion were already employed.

Our analyses have several implications for the integration of refugees. First, Syrian educational degrees serve as a reasonable indicator of educational resources. Second, while a substantial part of the population of Syrians has upper-secondary and tertiary degrees, those not completing primary education possess rather few educational resources on average, which is also reflected in their on average low levels of scientific knowledge. For these persons, prospects of integration in the German labor market are mostly limited to unqualified positions. The knowledge levels of those completing primary or lower secondary education vary considerably with some individuals scoring low and others scoring far above average. As low levels of scientific knowledge increase the risk of not being employed, less educated individuals should be prioritized in terms of their inclusion in educational programs to facilitate their future inclusion in the German labor market. A considerable share of Syrians possesses high degrees and high knowledge levels, suggesting good prospects for their labor marked integration. Others have comparably high knowledge levels not reflected by their degrees. Identifying them and helping them realize their full economic potential will benefit these individuals and the German labor market and social system alike.

References

Alba, R., & Foner, N. (2015). *Strangers No More: Immigration and the Challenges of Integration in North America and Western Europe*. Princeton, New Jersey: Princeton University Press. https://doi.org/10.23943/princeton/9780691161075.001.0001

BAMF – German Federal Office for Migration and Refugees. (2019*). Das Bundesamt in Zahlen 2018. Asyl.* Retrieved from http://www.bamf.de/SharedDocs/Anlagen/DE/Publikationen/Broschueren/bundesamt-in-zahlen-2018-asyl.pdf?__blob=publicationFile.

Berry, J. W. (1997). Immigration, Acculturation, and Adaptation. *Applied Psychology 46*(1), 5–34. https://doi.org/10.1111/j.1464-0597.1997.tb01087.x

Chiswick, B. R., & Miller, P. W. (2001). A model of destination-language acquisition: application to male immigrants in Canada. *Demography 38*(3), 391–409. https://doi.org/10.1353/dem.2001.0025

Cortes, K. E. (2004). Are Refugees Different from Economic Immigrants? Some Empirical Evidence on the Heterogeneity of Immigrant Groups in the United States. *Review of Economics and Statistics 86*(2), 465–80. https://doi.org/10.1162/003465304323031058

Crul, M., Lelie, F., Biner, Ö., Bunar, N., Keskiner, E., Kokkali, I., … Shuayb, M. (2019). How the different policies and school systems affect the inclusion of Syrian refugee children in Sweden, Germany, Greece, Lebanon and Turkey. *Comparative Migration Studies, 7*(1), 1–20. https://doi: 10.1186/s40878-018-0110-6

De Vroome, T., & Van Tubergen, F. (2010). The employment experience of refugees in the Netherlands. *International Migration Review 44*(2), 376–403. https://doi.org/10.1111/j.1747-7379.2010.00810.x

Destatis – German Federal Statistical Office. (2019). *Ausländische Bevölkerung 2005, 2010 und 2014 bis 2018 nach ausgewählten Staatsangehörigkeiten.* Retrieved from https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Migration-Integration/Tabellen/auslaendische-bevoelkerung-staatsangehoerigkeit-jahre.html.

Dryden-Peterson, S. (2015). *The Educational Experiences of Refugee Children in Countries of First Asylum*. Washington, DC: Migration Policy Institute.

Dustmann, C. (1996). The Social Assimilation of Immigrants. Journal of Population *Economics, 9*(1), 37–54. https://doi.org/10.1007/PL00003825

Dye, D. A., Reck, M., & McDaniel, M. A. (1993). The validity of job knowledge measures. *International Journal of Selection and Assessment, 1*(3), 153–157. https://doi: 10.1111/j.1468-2389.1993.tb00103.x

Esser, H. (2006). *Sprache und Integration: die sozialen Bedingungen und Folgen des Spracherwerbs von Migranten*. Frankfurt: Campus.

Evans, J. J., Floyd, R. G., McGrew, K. S., & Leforgee, M. H. (2002). The relations between measures of Cattell–Horn–Carroll (CHC) cognitive abilities and reading achievement during childhood and adolescence. *School Psychology Review, 31*, 246–262. https://doi.org/10.1080/02796015.2002.12086154

FitzGerald, D. S., & Arar, R. (2018). The Sociology of Refugee Migration. *Annual Review of Sociology, 44*(1), 387–406. https://doi.org/10.1146/annurev-soc-073117-041204.

Friedberg, R. M. (2000). You Can't Take It with You? Immigrant Assimilation and the Portability of Human Capital. *Journal of Labor Economics, 18*(2), 221–251. https://doi.org/10.1086/209957

Gebel, M. (2012). *Transitions from Education to Work in Syria. Results of the Youth Transition Survey 2009*. European Training Foundation.

Hunkler, C., & Khourshed, M. (2020). The Role of Trauma for Integration. The Case of Syrian Refugees. *Soziale Welt 71*(1–2), 90–122. https://doi.org/10.5771/0038-6073-2020-1-2-90

Kalter, F., & Granato, N. (2002). Demographic change, educational expansion, and structural assimilation of immigrants: the case of Germany. *European Sociological Review 18*(2), 199–216. https://doi.org/10.1093/esr/18.2.199

Khourshed, M., Hunkler, C., Méango, R., & Börsch-Supan, A. (2019). *Qualifications, Potentials and Life Courses of Syrian Asylum Seekers in Germany.* MEA-Working Paper 2019-1. Munich: Max-Planck-Institute for Social Law and Social Policy. https://doi.org/10.2139/ssrn.3441134

Kogan, I. (2016). Integration Policies and Immigrants' Labor Market Outcomes in Europe. *Sociological Science, 3,* 335–358. https://doi.org/10.15195/v3.a16

Kogan, I., & Kalter, F. (2020). An Empirical-Analytical Approach to the Study of Recent Refugee Migrants in Germany. *Soziale Welt, 71*(1–2), 2–23. https://doi.org/10.5771/0038-6073-2020-1-2-3

Martin, M. O., Mullis, I. V. S., Foy, P., Stanco, G. M., International Association for the Evaluation of Educational Achievement, & Trends in International Mathematics and Science Study (Eds.) (2012). *TIMSS 2011 international results in science.* IEA, TIMSS & PIRLS, International Study Center, Lynch School of Education, Boston College.

Massey, D. S., Arango, J., Hugo, G., Kouaouci, A., Pellegrino, A., & Taylor, J. E. (1998). *Worlds in Motion: Understanding International Migration at the End of the Millenium.* Oxford: Clarendon Press.

McGrew, K. S., & Hessler, G. L. (1995). The relationship between the WJ-R Gf-Gc cognitive clusters and mathematics achievement across the life-span. *Journal of Psychoeducational Assessment, 13*(1), 21–38. https://doi.org/10.1177/073428299501300102

Mullis, I. V. S., Martin, M. O., Foy, P., & Arora, A. (2012). *TIMSS 2011 international results in mathematics.* TIMSS & PIRLS International Study Center.

OECD – Organisation for Economic Co-operation and Development. (2016). *Making Integration Work: Refugees and others in need of protection,* OECD Publishing, Paris. https://doi.org/10.1787/9789264251236-en

Ones, D. S., Viswesvaran, C., & Dilchert, S. (2005). Cognitive Ability in Selection Decisions. In O. Wilhelm, & R. W. Engle (Eds.), *Handbook of understanding and measuring intelligence* (p. 431–468). Thousand Oaks: Sage Publications. https://doi.org/10.4135/9781452233529.n24

Rubin, D. B. (1987). *Multiple Imputation for Nonresponse in Surveys.* New York: Wiley. https://doi.org/10.1002/9780470316696

Rudmin, F. (2009). Constructs, measurements and models of acculturation and acculturative stress. *International Journal of Intercultural Relations, 33*(2), 106–123. https://doi.org/10.1016/j.ijintrel.2008.12.001

Salikutluk, Z., Giesecke, J., & Kroh, M. (2016). Refugees entered the labor market later than other migrants. *DIW Economic Bulletin, 6*(34/35), 407–413.

Salthouse, T. (1996). The Processing-Speed Theory of Adult Age Differences in Cognition. *Psychological Review, 103,* 403–428. https://doi.org/10.1037/0033-295X.103.3.403

Schepens, J., van Hout, R., & Jaeger, T. F. (2020). Big data suggest strong constraints of linguistic similarity on adult language learning. *Cognition, 194,* 104056. https://doi.org/10.1016/j.cognition.2019.104056

Schipolowski, S., & Edele, A. (2019). *Dokumentation der Kompetenztestung im Rahmen der IAB-BAMF-SOEP-Befragung von Geflüchteten 2017, Stichproben M3-M5.* SOEP Survey Papers 593: Series B. Berlin: DIW/SOEP.

Schipolowski, S., Wilhelm, O., Schroeders, U., Kovaleva, A., Kemper, C. J., & Rammstet, B. (2013). BEFKI GC-K. A Short Scale for the measurement of crystallized intelligence. *Methoden, Daten, Analysen 7*(2), 153–181.

Schroeders, U., Wilhelm, O., & Olaru, G. (2016). The influence of item sampling on sex differences in knowledge tests. *Intelligence, 58,* 22–32. https://doi.org/10.1016/j.intell.2016.06.003

Schupp, J., Brücker, H., Jacobsen, H., Jaworski, J., Kosyakova, Y., Liebau, E., Pagel, L., Richter, D., Rother, N., Schacht, D., Scheible, J. A., & Siegert, M. (2018). Bildung, Sprache und kognitive Potenziale. In H. Brücker, N. Rother, & J. Schupp (Eds.), *IAB-BAMF-SOEP-Befragung von Geflüchteten 2016: Studiendesign, Feldergebnisse sowie Analysen zu schulischer wie beruflicher Qualifikation, Sprachkenntnissen sowie kognitiven Potenzialen*, DIW Berlin: Politikberatung kompakt (123), p. 19–86.

Seethaler-Wari, S. (2019). *Asylum Seekers of the Syrian Conflict: procedures and patterns of settlement in Germany*. MMG Working Papers, 19(19–04), 1–37. Retrieved from http://hdl.handle.net/21.11116/0000-0005-D562-C

Selter, C., Walter, D., Walther, G., & Wendt, H. (2016). Mathematische Kompetenzen im internationalen Vergleich: Testkonzeption und Ergebnisse. In H. Wendt, W. Bos, C. Selter, O. Köller, K. Schwippert, & D. Kasper (Eds.), TIMSS 2015: *Mathematische und naturwissenschaftliche Kompetenzen von Grundschulkindern in Deutschland im internationalen Vergleich* (pp. 79–136). Waxmann.

Steffensky, M., Kleickmann, T., Kasper, D., & Köller, O. (2016). Naturwissenschaftliche Kompetenzen im internationalen Vergleich: Testkonzeption und Ergebnisse. In H. Wendt, W. Bos, C. Selter, O. Köller, K. Schwippert, & D. Kasper (Eds.), *TIMSS 2015: Mathematische und naturwissenschaftliche Kompetenzen von Grundschulkindern in Deutschland im internationalen Vergleich* (pp. 137–188). Waxmann.

Taub, G. E., Floyd, R. G., Keith, T. Z., & McGrew, K. S. (2008). Effects of general and broad cognitive abilities on mathematics achievement. *School Psychology Quarterly, 23*(2), 187–198. https://doi.org/10.1037/1045-3830.23.2.187

UNESCO – United Nations Educational, Scientific and Cultural Organization. (2020*). ISCED Mapping 2011 for Syrian Arab Republic*. Retrieved from http://uis.unesco.org/en/isced-mappings

UNHCR – United Nations High Comissioner for Refugees. (2019). *Stepping up. Refugee education in crisis*. Geneva: UNHCR. Retrieved from https://www.unhcr.org/publications/education/5d651cbd4/stepping-refugee-education-crisis.html?query=Stepping%20Up:%20Refugee%20%20Education%20in%20Crisis

Wilhelm, O., Schroeders, U., & Schipolowski, S. (2014). *Berliner Test zur Erfassung fluider und kristalliner Intelligenz für die 8. bis 10. Jahrgangsstufe (BEFKI 8–10)*. Göttingen: Hogrefe.

Zieky, M. (1993). Practical questions in the use of DIF statistics in item development. In P. W. Holland, & H. Wainer (Eds.), *Differential item functioning* (pp. 337–347). Hillsdale, NJ: Lawrence Erlbaum.

Appendix

Table A1: Programs and degrees in the Syrian education system

Education program	Entrance requirements	Degrees	Entrance age	Duration (years)	ISCED 2011 level	Categories used in analyses
Never attended school						No degree
Early childhood ed.	3 years of age	-	3	3	Early childhood	No degree
Primary ed.	6 years of age	-	6	6	Primary	Primary
Intermediate ed.	Completion of primary ed.	Basic educ. cert.	12	3	Lower secondary	Lower secondary
General secondary ed.	Basic ed. cert.	General secondary educ. cert.	15	3	Upper secondary	Upper & postsecondary
Vocational secondary ed.	Basic ed. cert.	Vocational secondary ed. cert.	15	3	Upper secondary	Upper & postsecondary
Technical institute programs	Secondary ed. cert. (vocational/general)	Certified assistant cert.	18	2	Postsecondary nontertiary	Upper & postsecondary
Technical institute programs, intermediate ed.	Secondary ed. cert. (vocational/general)	Technical institute cert.	18	2	Short-cycle tertiary	Tertiary
Bachelor's programs	Secondary ed. cert. (vocational/general)	Bachelor's degree	18	4	Bachelor's or equivalent level	Tertiary
Higher institute of administration	Secondary ed. cert. (vocational/general)	Bachelor's degree	18	5	Bachelor's or equivalent level	Tertiary
Engineering and medicine programs	General secondary ed. cert.	Bachelor's degree	18	5	Bachelor's or equivalent level	Tertiary
Diploma qualification and specialization	Bachelor's degree	Diploma	22	1	Bachelor's or equivalent level	Tertiary
Master's programs	Bachelor's degree	Master's degree	22	2	Master's or equivalent level	Tertiary
National institute for administration	Bachelor's degree	Higher cert.	22	3	Master's or equivalent level	Tertiary
Doctorate programs	Master's degree	Doctoral degree	24	2–4	Doctoral or equivalent level	Tertiary

Notes. Cert. = certificate; ed. = education. Information listed in columns 1 to 6 was taken from the UNESCO Institute of Statistics International Standard Classification of Education (ISCED) Mapping (UNESCO, 2020) database, which is based on the year 2015. Column 7 shows the collapsed category scheme used for the analyses.

Table A2: Summary Statistics

	Imputed data	Original data				
	M	*M*	*SD*	*Min.*	*Max.*	*n*
Employed (dependent variable)	Not imputed	0.091		0.000	1.000	263
Educational degree						261
No degree	0.234	0.230		0.000	1.000	
Primary	0.207	0.207		0.000	1.000	
Lower secondary	0.221	0.222		0.000	1.000	
Upper/postsecondary	0.224	0.226		0.000	1.000	
Tertiary	0.114	0.115		0.000	1.000	
Education interrupted	0.647	0.652		0.000	1.000	256
Scientific knowledge test	90.964	92.255	8.670	71.498	115.288	205
Female	0.240	0.240		0.000	1.000	263
Age at arrival in Germany	29.151	29.161	10.907	16.000	66.000	261
Child(ren) in Germany: 1 or more	0.328	0.339		0.000	1.000	248
Duration of stay in Germany (years)	1.509	1.502	0.674	0.167	3.833	259
German language skills (Interviewer assessed) 0 = "bad" to 4 = "very good"	1.541	1.545	1.451	0.000	4.000	255
Residence status						217
Other	0.113	0.102		0.000	1.000	
Subsidiary protection	0.240	0.230		0.000	1.000	
Full refugee/asylum status	0.646	0.668		0.000	1.000	
Health (self-assessed) 1 = "poor" to 5 = "excellent"	3.358	3.360	1.289	1.000	5.000	261
Intention to stay in Germany						260
Uncertain	0.418	0.491		0.000	1.000	
Short-term	0.201	0.200		0.000	1.000	
Long-term	0.381	0.381		0.000	1.000	

Notes. Min. = Minimum, Max. = Maximum. $n_{imputed}$ = 263.