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Aileen Edele, Cornelia Kristen, Petra Stanat & Gisela Will

The education of recently arrived refugees in Germany: conditions, processes, and outcomes

Around the world, the number of refugees is at a record high. Although most forcibly displaced persons seek refuge within their home country or in a neighboring state (UNHCR, 2020), a large number of refugees have reached Europe in recent years, and many of them have settled in Germany (Eurostat, 2020).

As many refugees were children and adolescents when they arrived in Germany (Bundesamt für Migration und Flüchtlinge, 2015, 2016, 2017, 2018), their successful incorporation into the educational system is of great relevance. This includes, above all, the acquisition of fundamental skills and competences as well as the eventual completion of educational qualifications. In the adult refugee population, most individuals are also quite young (Spörlein, Kristen, Schmidt, & Welker, 2020). To succeed in the labor market, many of them need to acquire further skills and competences as well as educational qualifications by, for example, taking language classes or attending training tailored to the requirements and the structure of the German labor market. The successful educational integration of recently arrived refugees at various stages in their life course is of paramount importance for them and for their receiving society alike.

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Does the education of refugees differ from that of other immigrants?

Scholars from various disciplines have quite thoroughly studied the educational success of immigrants and their offspring and the conditions that facilitate or jeopardize their educational achievement and attainment. However, these analyses have rarely focused on refugees. With the recent surge in refugee migration, this has changed profoundly.

The reasons for leaving their country of origin differ between refugees and other immigrants. Whereas refugees are pushed out of their home countries because of persecution, war or violent conflict, labor immigrants typically emigrate because of perceived economic opportunities in the destination country, such as better-paid and more secure jobs (Chiswick, 1999; Cortez, 2004). In contrast to refugees who often cannot return to their country of origin, labor immigrants usually have the opportunity to move back.

Some scholars have argued that refugee migration is fundamentally different from other forms of migration and therefore has to be treated differently, while others have maintained that refugee migration is simply a form of migration that takes place under special circumstances (FitzGerald & Arar 2018; Kogan & Kalter, 2020). The claim of the latter position is that “the processes underlying the integration of *all* immigrants (including refugee immigrants) are governed by the same basic mechanisms” (Kogan & Kalter 2020, p. 8) and that it is hence possible to subsume the range of conditions that are specific to refugees into existing theoretical models (Kogan & Kalter, 2020).

In this special issue, we take up this ongoing discussion on the educational incorporation of recently arrived refugees. We are interested in the degree to which the processes identified as relevant for other immigrants apply to refugees, and we aim to identify refugee-specific conditions that shape their education in the early period after their arrival. The education of recently arrived refugees could differ from that of other new immigrants for several reasons that are related to the typical obstacles refugees face and need to overcome in order to adjust and succeed (Berry, 1997; Cerna, 2019; McBrien, 2005). These obstacles are linked to the forced nature of refugee migration and related conditions before, during and after migration takes place (Dryden-Peterson, 2016; Ryan, Dooley & Benson, 2008). While they still lived in their home country, young refugees were often unable to attend school continuously due to adverse conditions prevalent there, and they had to interrupt their schooling career abruptly when they had to leave (Cerna, 2019; Dryden-Peterson, 2016). During their journey to a safe place, which in many cases was prolonged and involved one or more transitional residences, many refugee children and adolescents attended provisional schools or did not go to school at all (Crul et al., 2019; UNHCR, 2019). Refugees are therefore more likely than other immigrants to have interrupted educational biographies and to enter educational institutions in the destination country at irregular points in time. In addition,

they typically do not speak the language of their destination country when they arrive, and hence, they have to continue their education with hardly any or only very basic skills in the language of instruction. Refugees also suffer from mental stress more often than other immigrants due to traumatic and strenuous experiences in their home country and on their journey to a new destination as well as postmigration stressors (Fazel, Reed, Panter-Brick, & Stein, 2012; Fazel, Wheeler, & Danesh, 2005; Hunker & Khoureshed, 2020). The resulting mental health problems that continue to impose a burden on their well-being are likely to impede learning developments (Medalia, & Revheim, 2002; Trivedi, 2006). Moreover, some scholars have argued that an insecure legal status in the destination country could hamper refugees' motivation and reduce their inclination to invest in education, and it may also affect the motivation of educators and instructors to support them (Echterhoff et al., 2020; Homuth, Welker, Will, & von Maurice, 2020).

With this special issue on the educational integration of refugees, we aim to contribute to the growing knowledge of their early educational pathways after immigration (e.g., de Paiva Lareiro 2019; El-Mafaalani & Massumi, 2019; Henschel et al., 2019; Homuth, Will, & von Maurice, 2020; Will & Homuth 2020; Wong & Schweitzer, 2017). The German case, with its substantive influx of refugees, seems well suited for this purpose. Recent data collections, which have generated rich information on this population, provide a good basis for such analyses. They allow us to take stock of refugees' educational situation in an important destination country within Europe and to examine how they have fared so far.

Outline of the special issue

This special issue presents quantitative-empirical research on the education of recent refugees in Germany, considering the relevant conditions, processes, and outcomes. This collection of papers approaches the topic from the perspectives of different disciplines, including educational science, sociology, and psychology. Its contributions address various stages of educational careers and a range of indicators of educational outcomes, such as daycare attendance in early childhood, the school achievements of secondary school students, and the transitions of adolescents and young adults after the completion of an initial vocational preparation course. In the first set of papers, the authors examine the conditions that are relevant to refugees' educational integration. The second set of contributions focuses on populations of mostly younger adult refugees. They explore the education these refugees have acquired in their countries of origin and how these educational resources shape their postmigration pathways. The outcomes under study include the acquisition of the destination language and labor market participation.

The empirical analyses presented in the papers use a range of current datasets that include samples of recent refugees in Germany. Some of these datasets provide information on refugees of different heritage countries in substantial numbers,

while others include smaller, usually more targeted samples, such as refugees of certain origins or refugees living in specific geographic areas. Although a few of the contributions make use of longitudinal data sources, they mostly rely on cross-sectional analyses. In some cases, the data collections were started only recently and do not yet provide longitudinal information on the measures of interest. In other cases, the focus on the initial wave of a longitudinal survey is due to the research interest, for example, when the goal is to describe the educational resources or credentials refugees attained in their country of origin. Some of the databases used in the studies presented in this volume also allow for comparisons with other recent immigrants (first generation), with second-generation immigrants, and/or with Germany's majority population, whereas others focus exclusively on refugees. Table 1 summarizes the various data sources on refugees analyzed in this special issue and indicates which empirical study draws upon which data set.

This collection of papers contributes to the current state of knowledge in at least three ways. First, it takes stock of the educational situation of refugees in Germany a few years after their arrival. Second, it identifies the conditions that facilitate (or hinder) their educational integration. Third, it provides insights into the question of whether the processes identified for other immigrants apply to refugees in similar ways or whether there are differences.

In the first paper, 'The role of socioeconomic, cultural, and structural factors in daycare attendance among refugee children', *Christoph Homuth, Elisabeth Liebau* and *Gisela Will* examine early education. They ask whether a range of conditions known to be relevant predictors of daycare participation matter for refugee children as well. For their analyses of refugees, they use data from the *IAB-BAMF-SOEP Survey of Refugees* and from the *ReGES study (Refugees in the German Educational System)*; for the comparison with children from other immigrant families and with children from majority families, they use the *German Socio-Economic Panel (SOEP)*. The analyses show that although a considerable proportion of refugee children receive early education, they attend daycare centers less often than children in either comparison group. The main result of the study is that a range of well-established factors that contribute to participating in early childhood education are relevant for refugee children as well. Most notably, children of employed mothers are most likely to be enrolled in early education. Refugee-specific conditions, in contrast, such as those associated with refugees' legal status or their living situation, seem to be largely unrelated to daycare participation.

The second paper, 'Mathematics and science proficiency of young refugees in secondary schools in Germany', by *Stefan Schipolowski, Aileen Edele, Nicole Mahler* and *Petra Stanat*, draws on data from the *IQB Trends in Student Achievement 2018* study, which assessed a representative sample of ninth-grade students in Germany. The authors examine the mathematics and science achievement of refugee students in comparison to other first-generation students, second-generation students, and ninth graders whose parents were born in Germany. Similar to the first paper, the study asks whether factors that are known to account for ethnic educational disparities also matter for refugee students. The findings re-

Table 1: Data sources on refugees included in this special issue

Data source	Refugees	Comparison group/s	Year	Sample size	Geographic area	Data used in
<i>IAB-BAMF-SOEP Survey of Refugees</i>	Various origins	--	Yearly data collection since 2016	Ca. 6,700 adults, ca. 6,000 children	Germany	Homuth, Liebau & Will
<i>Refugees in the German Educational System (ReGES)</i>	Various origins	--	Biannual data collection since 2018	Ca. 4,800 (ca. 2,400 in the preschool cohort)	Bavaria, Hamburg, North Rhine-Westphalia, Rhineland-Palatinate, and Saxony	Homuth, Liebau & Will
<i>IQB Trends in Student Achievement 2018</i>	Various origins	First-generation and second-generation immigrants and students whose parents were born in Germany	2018	Ca. 45,000 (thereof ca. 900 refugees)	Germany	Schipolowski, Edele, Mahler & Stanat
<i>Recent Immigration Processes and Early Integration Trajectories in Germany (ENTRA)</i>	Syrians	Recent immigrants from Italy, Poland and Turkey	2019 and 2020/21 (two waves)	Ca. 4,600 (ca. 1,300 Syrians)	Five cities/urban areas in Germany	Kristen & Seuring
<i>Refugees and their early Integration in Society and Education (RISE)</i>	Various origins	--	2017, 2018, 2019, and 2021 (four waves)	Ca. 600	Baden-Württemberg	Maué, Diehl & Schumann
<i>Qualifications, Potentials and Life Courses of Syrian Asylum Seekers in Germany (QPLC)</i>	Syrians	--	2017	Ca. 300	Bavaria	Hunkler, Edele & Schipolowski

Notes. Sample size refers to the number of cases available in the respective data set (in case of longitudinal data, in the first measurement). It is not necessarily equivalent to the analysis samples used for the empirical studies.

veal that refugees attain considerably lower achievement scores than students from all other groups, including other first-generation immigrants. In line with a variety of well-established results on achievement gaps between immigrant and majority students, refugees' socioeconomic background and, most importantly, their destination-language skills largely account for the observed disadvantages. Again, conditions known to be key determinants of immigrants' educational success seem to be driving educational disparities for refugees in the early period after their arrival.

In the third paper, ‘Young refugees in prevocational preparation classes: Who is moving on to the next step?’, *Elisabeth Maué*, *Claudia Diehl* and *Stephan Schumann* concentrate on students in prevocational preparation classes, which were set up specifically for refugees. Due to the large share of adolescents and young adults among recent refugees, this educational stage is of particular relevance. The smaller longitudinal dataset of the RISE study (*Refugees and their early Integration into Society and Education*) covers four measurement points. It was tailored to capture the educational decisions individuals make after completing a prevocational preparation class and allows for investigations into the transition from a preparatory educational program into regular educational pathways or into trajectories outside the education system. The authors find that the vast majority of students attending a prevocational preparation class remain in education. Almost two-thirds of the sample moves on to a regular educational pathway, approximately one-third repeats the prevocational preparation class, and only a few individuals leave the educational system. Refugees’ destination-language skills and contacts with Germans who are supporting them predict transitions into regular education. Similar to the achievement of ninth graders, these findings emphasize that becoming proficient in the language of the destination country is key to succeeding in the educational system.

The fourth contribution, ‘Destination-language acquisition of recently arrived immigrants: Do refugees differ from other immigrants?’, is the first of the set of papers addressing the education of adult refugees. *Cornelia Kristen* and *Julian Seuring* use data from the first wave of the ENTRA project (*Recent Immigration Processes and Early Integration Trajectories in Germany*), whose sample includes Syrian refugees as well as other new arrivals from Italy, Poland, and Turkey. The authors describe the levels of proficiency new immigrants display shortly after arrival. Emanating from a well-established model of language acquisition (Chiswick & Miller, 2001), they consider a variety of conditions that are known to foster language learning. Their findings reveal that the majority of recent immigrants improve their German language skills after arrival, with refugees’ learning curve being steeper than that of other recent immigrants. They further demonstrate that the same conditions accounting for language acquisition among other immigrants matter for refugees as well. The authors conclude that language learning is a general process, with exposure to the destination language emerging as crucial for acquiring proficiency. At the same time, they show that compared to other recent immigrants, refugees seem to benefit more from certain forms of exposure, such as attending language courses.

The concluding fifth contribution, ‘The role of educational resources in the labor market integration of refugees: The case of Syrian asylum seekers in Germany’ by *Christian Hunkler*, *Aileen Edele*, and *Stefan Schipolowski*, is based on data from the *Qualifications, Potentials and Life Courses of Syrian Asylum Seekers in Germany* (QPLC) project, a study of adult refugees from Syria. The data collection covers several indicators of educational resources, including a test of scientific knowledge. Because other studies have also employed this test, it is possible

to compare the results of refugees to the results of the German resident population. The authors describe a selection of the educational resources Syrian refugees possessed when they came to Germany and examine how these resources shape their labor market participation within 1.5 years, on average, after their arrival. The findings reveal a high share of Syrian refugees with interrupted educational biographies. Nevertheless, the association between degrees acquired in Syria and scientific knowledge is very similar to the corresponding association in the German comparison sample. The results further indicate that premigration educational resources play a pivotal role in refugees' labor market integration, as individuals with higher test scores had a higher likelihood of being employed. In contrast, refugee-specific conditions, such as those associated with an insecure legal status, are unrelated to this outcome.

Conclusions

The papers presented in this special issue provide multifaceted findings on refugees' educational integration a few years after their arrival. Overall, there are many reasons for optimism. A large proportion of students in vocational preparation courses remain in education and move on to a regular educational pathway (Maué et al.). Adult refugees also seem to make substantial progress in acquiring German language skills (Kristen & Seuring). However, in some respects, refugees lag behind other first-generation immigrants as well as second-generation immigrants and the majority population. Refugee students, for instance, show lower achievement scores in secondary school (Schipolowski et al.), and adult refugees have fewer educational resources at the time they arrive in Germany than the German reference group (Hunkler et al.). These findings are in line with those reported for other outcomes, such as the distribution of refugees across school tracks, where they are overrepresented in low tracks and underrepresented in higher tracks (Henschel et al., 2019; Will & Homuth, 2020), or in the labor market, where despite growing employment rates, substantial gaps remain (Brücker, Kosyakova, & Schuß, 2020).

As many of the empirical contributions presented in this volume examine the conditions of educational success and education-related outcomes, they point to factors indicating how to support and facilitate refugees' educational integration and overcome their initial disadvantages. Several papers emphasize that destination-language learning is crucial – in particular, in the early years after arrival – in order to develop a good foundation for gaining proficiency (Hartshorne, Tenenbaum, & Pinker, 2018; Kristen, Mühlau, & Schacht, 2016). For example, Schipolowski and colleagues show that German language skills account for a large proportion of refugee students' achievement gap in secondary school. They are also essential for the transition from special preparation classes into regular education pathways (Maué et al.). The findings of Kristen and Seuring further suggest that exposing refugees to the destination language, especially in the form of struc-

tured instruction, is a promising route to support language learning. Their findings corroborate the importance of easily accessible and high-quality language instruction.

In line with previous findings, the presented studies additionally indicate that the socioeconomic and cultural resources refugees bring with them are important for their educational success (Homuth et al.; Maué et al.; Schipolowski et al.) as well as for their labor market participation (Hunkler et al.). Even though these resources were acquired in the refugees' countries of origin, they apparently continue to be relevant. However, socioeconomic resources seem to matter less for refugees than for other immigrant populations (Schipolowski et al.). This result could be related to differences between societies in the distribution of educational qualifications. As most refugees come from countries in which the level of education is considerably lower than in Germany (Spörlein et al., 2020), it might be difficult to compare their educational resources directly. For example, having a medium-level degree in a country where the number of people reaching this qualification is low means something different than in a country where the majority acquires at least a medium-level degree (Spörlein & Kristen, 2019). In relative terms, then, the former have a higher level of education than the latter. Information on educational resources in terms of their relative rather than their absolute level is rarely considered in empirical analyses. Nevertheless, these distributional differences and the hidden characteristics underlying this selectivity might contribute to the observed differential associations between (premigration) socioeconomic resources and (postmigration) educational outcomes.

One of the major conclusions emanating from this special issue is that the conditions known to be the major drivers of educational success and of other education-related aspects of immigrants' incorporation also apply to refugees. Forced immigrants differ from other immigrants in their starting conditions, for instance, in their initial language skills or in the resources they bring with them, but their educational integration seems to be affected by similar factors. This is not to say that refugee-specific conditions, such as interrupted educational careers or the experiences of trauma and stress, are insignificant and do not merit our attention. The presented studies may have assessed these conditions insufficiently, or these conditions may be more relevant for other outcomes than those examined here, for instance, psychological adaptation. Moreover, the possibility that these aspects gain in importance and that their consequences become increasingly visible over the course of time cannot be ruled out. However, for the time being, the findings presented in this special issue consistently indicate that we should not lose sight of the more general processes.

Some of the limitations in this collection of papers on refugees' early educational integration point to avenues for future research. For example, the presented contributions mostly rely on cross-sectional analyses and therefore provide snapshots of refugees' situations in the education system and beyond, rather than determining educational trajectories or developments in education-related outcomes. However, again, many of the datasets on which the papers draw are longitudi-

nal (see Table 1). Future analyses, therefore, will be able to follow refugees' pathways over time, allowing for causal interpretations. Another avenue for progress relates to the evaluation of the potential effects of educational policies or institutional conditions. Such endeavors may, on the one hand, evaluate the consequences of implementing specific measures aimed at supporting integration, such as language-support programs. On the other hand, they may compare the integration of immigrants in educational settings between countries (e.g., Koehler & Schneider, 2019) or between regions that differ in their specific policies or institutional conditions. The various data sets represented in this special issue provide important resources for pursuing such undertakings, which will continue to further our knowledge of the prerequisites, processes, and outcomes related to refugees' education.

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Christoph Homuth, Elisabeth Liebau & Gisela Will

The role of socioeconomic, cultural, and structural factors in daycare attendance among refugee children

Abstract

Previous research has found that ethnic educational inequalities arise even before children enroll in primary school. It has been shown that especially for migrants, early participation in education has a positive impact on later educational outcomes, with the acquisition of the host-country language being one of the main mechanisms driving this effect. With the influx of over one million refugees into Germany in recent years, the integration of migrant children, especially refugee children, into the educational system is more salient in educational politics than ever. The first empirical findings on early and preschool education among refugees have shown that while a considerable share of refugee children attend a daycare center, they do so at lower rates than native and other migrant children. This paper aims to examine whether inequalities in the early education of refugee children can be explained by different socioeconomic and migration-related factors known to be associated with inequality in daycare attendance and to explore whether additional refugee-specific factors affect the likelihood of enrollment in preschool education. With data from the IAB-BAMF-SOEP Survey of Refugees in Germany and the study Refugees in the German Educational System (ReGES), we show that conventional explanatory variables do affect refugee children's attendance of daycare centers. In addition to children's age, the employment status of the mother, and the length of stay in Germany are particularly important. However, we see regional differences in participation in preschool education that cannot be explained by the municipal childcare supply.

Keywords

Refugees; Early education; Preschool education; Daycare; Social inequality

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Der Einfluss sozioökonomischer, kultureller und struktureller Faktoren auf den Kindertagesstättenbesuch von geflüchteten Kindern

Zusammenfassung

Bisherige Studien haben gezeigt, dass ethnische Bildungsungleichheiten bereits vor der Einschulung entstehen. Es wurde gezeigt, dass insbesondere für Lernende mit Migrationshintergrund eine frühe Bildungsbeteiligung einen positiven Einfluss auf die späteren Bildungsergebnisse hat, wobei der Erwerb der Sprache des Aufnahmelandes einer der Hauptmechanismen für diesen Effekt ist. Mit der Zuwanderung von über einer Million Schutzsuchenden nach Deutschland in den letzten Jahren ist die Integration von Migrantenkindern, insbesondere von geflüchteten Kindern, in das Bildungssystem bildungspolitisch aktueller denn je. Erste empirische Befunde zur frühkindlichen und vorschulischen Bildung von Geflüchteten haben gezeigt, dass zwar ein erheblicher Anteil der geflüchteten Kinder eine Kindertagesstätte besucht, ihre Betreuungsquoten sind jedoch geringer als die von einheimischen und anderen Migrantenkindern. In diesem Beitrag soll untersucht werden, ob Ungleichheiten in der frühen Bildung von geflüchteten Kindern durch verschiedene sozioökonomische und migrations-spezifische Faktoren erklärt werden können, von denen aus der Literatur bekannt ist, dass sie mit Ungleichheiten im Kindertagesstättenbesuch einhergehen, und ob zusätzliche flüchtlingsspezifische Faktoren die Wahrscheinlichkeit den Besuch einer Kindertagesstätte beeinflussen. Mit Daten aus der IAB-BAMF-SOEP-Befragung von Geflüchteten in Deutschland und der Studie Refugees in the German Educational System (ReGES) zeigen wir, dass bekannte Determinanten den Kindertagesstättenbesuch von geflüchteten Kindern tatsächlich beeinflussen. Neben dem Alter der Kinder sind vor allem der Erwerbsstatus der Mutter und die Dauer des Aufenthalts in Deutschland von Bedeutung. Wir sehen jedoch regionale Unterschiede in der frühkindlichen Bildungsbeteiligung, die nicht durch das kommunale Kinderbetreuungsangebot erklärt werden können.

Schlagworte

Geflüchtete, frühe Bildung, vorschulische Bildung, Kindertagesstätte, soziale Ungleichheit

1. Introduction

Several studies have shown that children with a migrant background do worse in primary school than those who are native-born (see, e.g., Dollmann, 2010; Gresch, 2012). Previous research has found that ethnic educational inequalities exist even before children enroll in primary school (e.g., Relikowski et al., 2015). Addressing these inequalities calls for the provision of special pedagogical support for migrant

children, especially in learning the language of the host country, as early as possible (see, e.g., Becker & Biedinger, 2006). Children with a migrant background benefit from attending daycare centers, and language acquisition (especially if the language that they speak at home is different from that of the host country) can be facilitated by appropriate support (Becker, 2010, 2019; Lee, Han, Waldfogel, & Brooks-Gunn, 2018). Thus, the recommendation that children attend a daycare center as early as possible also applies to refugee children (see, e.g., von Maurice, Balaban, Will, & Roßbach, 2020).

For refugee children in Germany, attending a daycare center often means coming into contact with the German language as well as with the cultural norms and values of the host society for the first time (see, e.g., Gambaro, Liebau, Peter, & Weinhardt, 2017; von Maurice et al., 2020). First study results indicate that refugee children who attend daycare centers have higher German proficiency than those who do not (Schild, Welker, & Will, in preparation). Refugee children in daycare centers can experience security and belonging as well as a child-friendly environment (Baisch, Lüders, Meiner-Teubner, Riedel, & Scholz, 2017). Furthermore, children's attendance of a daycare center may have positive effects on their parents and families (see, e.g., Gambaro et al., 2017; von Maurice et al., 2020): In particular, the establishment of social contacts is linked to positive effects on parents' acquisition of cultural knowledge and language skills (for early evidence on this relationship, see Gambaro, Neidhöfer, & Spieß, 2019).

Considering the current refugee immigration context, in which more than 200,000 asylum applications for children under the age of 7 were made in 2015–2017 alone (Federal Office for Migration and Refugees (BAMF – Bundesamt für Migration und Flüchtlinge), 2016, 2017, 2018), the question of early integration of newly immigrated children into daycare centers is particularly relevant. On the other hand, there is an open theoretical discussion on whether refugee status should be regarded as a specific subcategory of immigrant status or as a separate dimension of inequality alongside, for example, gender, social class, and immigrant background (e.g., El-Mafaalani & Massumi, 2019). This discussion particularly relates to the fact that the contextual and individual conditions of refugees can sometimes differ drastically from those of other migrant groups.

However, until now, there have been only a few studies on refugees' educational situations, as refugee groups have not been studied thoroughly – mainly due to data limitations.

This paper aims to examine whether inequalities in the early education of refugee children can be explained by different known mechanisms of broader social and ethnic inequalities in participation in early and preschool education, and we explore whether additional refugee-specific variables (e.g., living in collective accommodation) further affect children's likelihood of attending daycare centers in particular.

We argue that known mechanisms of social and ethnic inequality in early childhood education affect refugees as well. We further argue that educational inequalities between refugee groups, i.e., from different countries of origin, and between

refugees and other migrant groups can be explained by additional migrant- and refugee-specific variables. To test our hypotheses, we use two unique data sets from Germany.

2. Participation of immigrants in daycare centers in Germany

Ethnic inequality in daycare usage behavior has been well established in previous literature (for an overview see Becker & Biedinger, 2016). The differences among three- to six-year-olds are not as pronounced as those among under-three-year-olds (see, e.g., Fuchs-Rechlin & Bergmann, 2014; Peter & Spieß, 2015). A comparison of the participation rates from 2009 and 2014 suggests that participation in early and preschool education is increasing overall, including among migrants, but the differences between children with and without a migrant background are still increasing slightly (see Aktionsrat Bildung, 2016, p. 124). According to recent register data, the daycare attendance rate of non-migrant children is increasing, while the corresponding rate of migrant children is stagnating or even decreasing: In 2018, 82 percent of children aged 3–6 with a migrant background were attending daycare centers, compared with 99 percent of children without a migration background. In the under-three age group, 20 percent of migrant children attended some form of childcare, compared to 41 percent of non-migrant children (Statistisches Bundesamt, 2019). However, migrants are not a homogeneous group. Peter and Spieß (2015) have shown that daycare rates vary among different migrant groups: For example, children of parents who both immigrated attend daycare centers relatively rarely.

First descriptive results on the participation of refugees in early and preschool education have shown that most 3-to-6-year-olds attend a daycare center, albeit at lower rates than native or other migrant children in this age group; for younger refugee children, the gap is even greater (Gambaro et al., 2017; Spieß, Westermaier, & Marcus, 2016). For children whose families came to Germany in the current refugee immigration wave, attendance of daycare centers is 80 percent among 3-to-6-year-olds and 15 percent among under-3-year-olds (Gambaro et al., 2017). Furthermore, there are significant regional differences (e.g., between eastern and western Germany) (ibid; Will, Balaban, Dröscher, Homuth, & Welker, 2018).

3. Theoretical explanations for daycare attendance

Sending a child to daycare can – as an educational decision – be understood as making an investment in the child’s competence development by providing an appropriate learning environment (see, e.g., Becker & Biedinger, 2016). This decision can be modeled as an interest-maximizing cost-benefit calculation that depends on

individual motivations and resources within a given structure of opportunities and restrictions (Breen & Goldthorpe, 1997). Different arguments can be integrated into this general theoretical model (see, e.g., Burghardt & Kluczniok, 2016; Burghardt, 2017). Moreover, the model allows us to take into account various factors related to the social and ethnic origin as well as differences among various groups of refugees.

3.1 Structural-level characteristics

Childcare costs are usually comparatively low in Germany because of public funding of daycare on the one hand and cost waivers for low-income families on the other hand. Local supply of childcare is the actual challenge. Although all children older than 12 months are legally entitled to childcare, in most regions, demand for places in daycare centers cannot be satisfied. There are significant regional and local differences, with a better situation in high-income suburbs and cities (see Alt, Bergruber, & Pötter, 2016) as well as in eastern Germany due to its history of family politics (see, e.g., Hank, Tillmann, & Wanger 2001). Overall, there is a lower supply of childcare for children up to the age of three years (Bertelsmann Stiftung, 2019). Previous studies have already shown that individual daycare attendance is significantly related to daycare supply (Fuchs-Rechlin & Bergmann, 2014; Geier & Riedel, 2008).

A low childcare rate is associated with problems finding daycare for families with and without a migration background. While migrants tend to live in metropolitan areas in western Germany and in larger cities in general, refugees are distributed more evenly across Germany and are also housed in rural areas and eastern Germany due to regulations allocating the hosting of refugees across the country (see BAMF, 2018). Thus, controlling for the regional supply of daycare may explain the differences in daycare attendance between migrants and natives to a greater extent than the differences between refugees and natives.

Concerning legal access, the time at which refugee children become entitled to receive childcare is a point of controversy (see Baisch et al., 2017). In most federal states, entitlement is granted if the child has been assigned to be hosted by a municipality in the respective federal state (see Deutsches Institut für Menschenrechte, 2017). Thus, regardless of their legal residence status and their residence within collective or private accommodation, refugee children are entitled to receive childcare from the age of one if they are no longer in an initial reception facility.¹

1 However, it remains unclear whether children in so-called “AnKER-Zentren”, which were established from 2018 in some federal states, are treated in practice like children in initial reception facilities. AnKER-Zentren are facilities in which asylum seekers initially are accommodated until their asylum application is decided and they are either assigned to be hosted in a certain municipality or obligated to return to their country of origin.

3.2 Mechanisms related to socioeconomic background

Parents of higher social classes tend to choose daycare centers more often than parents of lower social classes. More highly educated parents know more about the possibilities and positive effects of early preschool education than less educated parents (Becker & Lauterbach, 2007; Becker & Tremel, 2006). In addition, higher-earning parents can afford childcare more easily (Becker & Tremel, 2006). Although costs are lower in absolute terms for low-income families, families at risk of poverty who have daycare expenses still pay almost as much in relation to their income as other households (see Schmitz, Spieß, & Stahl, 2017). It is well established that mothers' employment status is central to explain daycare attendance. Also, more highly educated mothers demand more childcare because of their higher opportunity costs of staying at home (Becker & Tremel, 2006; Kreyenfeld & Krapf, 2010).

In previous studies, ethnic differences in daycare attendance have been largely explained by differences in socioeconomic background (for an overview, see Becker & Biedinger, 2016). Migrants use daycare centers less than the population overall largely because of their lower socioeconomic status and lower levels of education. For older migrant children, in particular, there is hardly any difference from the native population in terms of daycare attendance after socioeconomic background is controlled for, while significant differences remain in the group of children under the age of three (see, e.g., Fuchs-Rechlin & Bergmann, 2014; Kreyenfeld & Krapf, 2010).

We assume that these mechanisms should also affect refugee families; however, it is conceivable that the effects on refugees could initially be weaker for various reasons. For example, the desire to take up gainful employment should be more pronounced among educated refugee women than among less educated refugee women as well. However, due to a lack of German language skills and possible legal barriers to labor market entry (e.g., recognition of foreign qualifications, work permits, restricted choice of place of residence), it is mostly not possible for refugees to directly take up employment after entering the country.

3.3 Migrant-specific mechanisms

Knowledge, or a lack thereof, has been argued to explain ethnic differences in daycare attendance because immigrants may have less knowledge of the availability of early childcare offers due to foreign socialization (see, e.g., Stichs & Rotermund, 2017). Differences in knowledge may also relate to other aspects, such as knowledge of possible cost waivers or legal entitlement to the use of such waivers. Social contacts with natives might help immigrants acquire knowledge of the education system (ibid.) or directly support them in the process of registering their children in a daycare center (see Baisch et al., 2017).

Parents' low German language proficiency is another important driver of ethnicity-based differences. In particular, children of mothers with low language proficiency attend daycare centers significantly less (e.g., Becker & Tremel, 2006). Poor German proficiency not only can be seen as an indicator of little knowledge of the education system in the host country but also may lower the chances that mothers make use of their childcare entitlements.

These factors, which can also be described as a lack of host country-specific cultural capital, should be especially relevant for newly arrived immigrants. As all refugee families, which we consider in this article, are first-generation immigrants, the variables mentioned in the section above should apply in particular to this immigrant group as well.

Cultural differences may also explain different daycare attendance rates (see, e.g., Fuchs-Rechlin & Bergmann, 2014; Sachverständigenrat deutscher Stiftungen für Integration und Migration, 2013). In particular, due to a more traditional gender division of labor in migrant families, women are less likely to be employed and to need daycare. In addition, in some countries of origin, daycares are less common, and care outside the family might therefore be less accepted (see Die Beauftragte der Bundesregierung für Migration, Flüchtlinge und Integration, 2011; for data on participation in preschool education in Syria, see World Bank, 2015).

Presumably, cultural differences wane over the course of generations. However, for first-generation migrants and thus for the refugees who arrived in recent years, the cultural ideas of the society of origin should still be prominent.

Last, it cannot be completely ruled out that admission practices in individual daycare centers are related to the lower daycare attendance of migrant children (see, e.g., Alt et al., 2016).

3.4 Refugee-specific mechanisms²

In addition to all the previously discussed drivers, some factors could contribute to explaining daycare attendance rates among refugee children specifically.

First, refugee children who have had traumatic experiences might have developed posttraumatic stress disorder (PTSD). In these cases, parents might hesitate to use daycares. However, it has been argued that the experience of traumatic events can lead refugees to be more motivated to remain in the host country (see, e.g., Hunkler & Khourshed, 2020) and thus to make special efforts to integrate.

Second, as refugee migration is a forced and nonvoluntary act, refugees might have a higher return orientation than other immigrant groups. An intention to return to one's home country reduces the benefits of investing in host country-spe-

2 The factors described in this section are, strictly speaking, specific aspects of ethnic inequality. However, as the described mechanisms are – due to the general conditions of forced migration and the specific characteristics of this immigrant group – particularly applicable to refugees, we summarize them as refugee-specific factors.

cific capital, in particular, the German language. Refugees may therefore consider regular attendance of a daycare center less beneficial for their children.

The same reasoning could apply if refugees have not received a secure residence status and therefore perceive their stay in the host country to be temporary. From the official side, as mentioned in section 3.1, there are no daycare access barriers based on residence status or type of accommodation after refugee children have left the initial reception facility. However, it cannot be ruled out that actual daycare center enrollment practices may cause problems in the admission of newly arrived migrants and therefore also for our specific target group. For example, Baisch et al. (2017, p. 24) state that inflexible admission regulations (e.g., allowing admission only at certain times of the year or on a first-come-first-served basis) can present access barriers for immigrant families.

3.5 Summary of hypotheses

Table 1 summarizes our hypotheses and what contribution the individual factors should make in explaining group differences in daycare attendance between people with and without a migration background and refugees.

Table 1: Hypotheses on daycare center attendance and group differences

Hypotheses on basic variables	Effects on group differences
<i>Structural variables:</i>	
Hypothesis 1: Regional undersupply of daycare has a negative impact on daycare attendance.	Differences between natives and migrants, in particular, should decrease. Additionally, differences between natives and refugees should decrease, but to a smaller extent.
<i>Socioeconomic variables:</i>	
Hypothesis 2: Children from families with a more privileged socioeconomic background are more likely to attend daycare.	Differences between natives and migrants, in particular, should decrease. Additionally, differences between natives and refugees should decrease, but to a smaller extent.
<i>Migrant-specific variables:</i>	
Hypothesis 3: Social contact with natives is positively associated with daycare attendance.	Differences among different migrant groups (including different refugee groups) should decrease.
Hypothesis 4: German language proficiency is positively associated with daycare attendance.	Differences among different migrant groups (including different refugee groups) should decrease.
Hypothesis 5: Children from families with fewer host country-specific cultural resources are less likely to attend daycare.	Differences between migrants and refugees, in particular, should decrease.
Hypothesis 6: Children from families with more traditional gender attitudes are less likely to attend daycare.	Differences among different migrant groups (including different refugee groups) should decrease.

Hypotheses on basic variables	Effects on group differences
<i>Refugee-specific variables:</i>	
Hypothesis 7a: Children at risk of posttraumatic stress disorder are <i>less</i> likely to attend daycare.	Differences among refugee groups should decrease. However, the direction of the effect is unclear.
Hypotheses 7b: Children at risk of posttraumatic stress disorder are <i>more</i> likely to attend daycare.	
Hypothesis 8: Children from families with a high return orientation are less likely to attend daycare.	Differences among different refugee groups should decrease.
Hypothesis 9a: Residence status has no effect on daycare attendance.	Whether the residence status contributes to differences between various refugee groups cannot be clearly predicted from the contradictory theoretical arguments.
Hypothesis 9b: An insecure residence status reduces the probability of daycare attendance.	

4. Data and methods

To analyze refugee children's daycare attendance, we use data from two data sets, the IAB-BAMF-SOEP Survey of Refugees in Germany³ (see Kühne, Jacobsen, & Kroh, 2019) and the Refugees in the German Educational System (ReGES) study (Will, Gentile, Heinritz, & von Maurice, 2018). In both studies, parents were the main respondents. The interviews were conducted during the 2017–2018 school year; the SOEP interviews were conducted at the end of 2017, and the ReGES interviews were conducted at the beginning of 2018.

4.1 SOEP data

The IAB-BAMF-SOEP Survey of Refugees in Germany consists of different subsamples of asylum seekers and refugees who arrived in Germany between January 2013 and December 2016. All subsamples were drawn from the Central Register of Foreigners. Altogether, 4,855 households were interviewed, resulting in 6,779 face-to-face interviews with adults and information on 5,942 children in the interviewed households in the initial interview. However, for the subsample of refugees in the analysis, only families who migrated to Germany since January 1, 2014, or thereafter were included.

As the data of the IAB-BAMF-SOEP Survey of Refugees in Germany were incorporated into the regular Socio-Economic Panel (SOEP) study (Goebel et al., 2019), they provide a basis for comparisons with other migrant groups in Germany as

3 The Institute for Employment Research (IAB), the Migration, Integration and Asylum Research Center at the Federal Office for Migration and Refugees (BAMF-FZ), and the Socio-Economic Panel (SOEP) joined together in a cooperative longitudinal project to survey a nationwide random sample of refugee households in Germany in late 2015: the IAB-BAMF-SOEP Survey of Refugees. We use v34 of the data.

well as with individuals without a migrant background who are part of the regular SOEP study.

Our analysis samples consist of $n = 1,215$ non-migrants, $n = 1,001$ migrants, and $n = 2,007$ refugees.⁴ We analyze two subgroups: children up to three years old and children aged three to six years but below school age. While all refugee children in the older age group were foreign-born, we also classify children in the younger age group as refugees if they were born in Germany, but their parents immigrated as refugees on January 1, 2014, or thereafter.

4.2 ReGES data

While the SOEP provides representative data on households, the ReGES study focuses explicitly on two refugee cohorts facing important educational transitions in the German education system. One of these cohorts includes 2,405 children aged four years or older who were not yet attending school at the time of the initial interview and whose parents were interviewed face-to-face.

The survey is being conducted in the five federal states of Bavaria, Hamburg, North Rhine-Westphalia, Rhineland-Palatinate, and Saxony. These states were systematically selected using various macro-level indicators (e.g., the share of assigned refugees, labor market conditions, and population density) (for more details on the study design see Will et al., 2018b).

In contrast to the SOEP, the ReGES sample was drawn from 120 municipalities selected based on the Central Register of Foreigners. Local registration offices provided the addresses of children in the relevant age groups who had moved to the municipality after January 1, 2014, and who were nationals of one of the current main countries of origin of asylum seekers with a high protection rate and who had been living in Germany for at least three consecutive months (for details on the sampling procedure, see Steinhauer, Zinn, & Will, 2019).

Our analysis sample consists of $n = 2,183$ children between ages four and six who had not yet started school at the interview date.

4 We used the variables *migback*, *arefback*, *immiyear* and *gebjahr* provided by the SOEP SUF (methodology report) to generate our group variables (see for details SOEP Group, 2019). According to *migback*, natives are children born after 2010 without a migration background (both the child and both parents were born in Germany). Migrants are children born after 2010 with a direct or indirect migration background according to *migback* and without a refugee background according to *arefback* (reason for immigrating was something other than flight and asylum). According to *arefback*, refugees are children born after 2010 with a direct or indirect refugee background who immigrated to Germany in 2014 or thereafter (for those at least three years old) or whose parent immigrated in 2014 or thereafter (for those younger than three years old).

4.3 Operationalization and methods

For the analysis of elementary education in the age range of 0–3 (younger than 36 months), we use the SOEP data and for the age range 3–6 (36 months and older), we use both the SOEP and the ReGES data.⁵ The SOEP data cover a representative German sample and allow comparison of refugees with the majority population and other migrant groups. The ReGES data provide additional information on the refugee-specific factors that we theorize to be influential in refugees' educational integration and allow us to examine differences among major refugee groups. For the 3–6 age group, we exclude all children who were of school age in the school year 2017/18 because we expect a strong selection effect from delayed school enrollment that would lead to biased results.

Our dependent variable is daycare attendance. We estimate linear probability models (LPMs) with robust standard errors because of the simple interpretation of the regression coefficients as changes in percentage points of the likelihood of attending daycare. We use a stepwise analysis approach, including another variable group in each step, and run the analyses separately for both data sets first to analyze how refugees' and other migrants' daycare attendance differs from that of natives; second, using the SOEP data, to examine how refugees in both age groups differ from migrants; and third, using SOEP data for 0-to-3-year-olds and SOEP and ReGES data for 3-to-6-year-olds, to evaluate how refugee groups differ from each other. Table A1 in the appendix provides information on the distributions of all the variables used for all subsamples.

Structural factors are operationalized by three variables. We use district size and federal state to control for different local and regional regulations. Additionally, we use the district-level attendance rate of all children in the 0–3 and 3–6 age groups who attend any form of childcare center as a proxy for the local provision of daycare places.

Socioeconomic background is operationalized by two main indicators: highest parental education level and highest family socioeconomic status. Parental education is measured on the International Standard Classification of Education (ISCED) scale. Socioeconomic status is measured on the International Socio-Economic Index of Occupational Status (ISEI) scale. We add a control for parents who have never been employed in Germany. As most of the refugees had not yet been employed in Germany at the time of the interview, we include the highest ISEI (HISEI) based on their employment in their countries of origin as well as a control for those who had never been employed in their countries of origin. In the ReGES analyses, we additionally include the number of books in the home in respondents' countries of origin as an internationally established indicator of sociocultural back-

5 We used multiple imputation to deal with missing data (for details, see the end of section 4). Due to high rates of missing data (which varied by group: natives = 20.6%, migrants = 13.6%, refugees = 63.6%) on children's birth months in the SOEP data, child age is a partially imputed variable. Therefore, the analysis samples varied in terms of the level of imputation. The alternative of including only cases with complete date information would certainly lead to biased results due to selection effects.

ground, and in the SOEP analyses, we include the current monthly family income, measured in income groups, as a quasi-metric variable. Furthermore, we control for the mothers' current employment.

Migrant-specific factors are included in the form of several variables: The self-rated German language proficiency of both parents separately is included as a z-standardized factor score of the subdomains of speaking, reading, and writing ($M = 0$, $SD = 1$; the original scale was 1 = "not at all" to 5 = "very good"; Cronbach's alphas range between 0.95 and 0.96). Additionally, in the SOEP analyses, we include a dummy indicator for whether the language spoken in the family is not German. To capture information deficits and initial legal barriers after immigration, we include the length of stay (in years) in Germany as a metric variable. Unfortunately, it is only possible to evaluate this variable for refugees, as the SOEP sample does not include any new immigrants who immigrated to Germany for reasons other than asylum in the age groups under six years. Thus, to control for host-specific knowledge and cultural convergence over the course of generations, we additionally include non-refugee migrants in these analyses if their parents either immigrated themselves or were born in Germany. Furthermore, we consider social contact with natives, measured on a six-point quasi-metric scale (from 1 = "never" to 6 = "daily contact") for the refugee samples. To test for the hypothesized impact of cultural differences, we include religiosity as a proxy for internalization of cultural norms in general but also as a proxy for traditional gender roles⁶ in particular. The indicator was measured on a 4-point scale (from 1 = "not at all religious" to 4 = "very religious") and entered as quasi-metric. Additionally, in the SOEP analyses, we include frequency of attendance of religious events and gatherings (on a quasi-metric scale from 1 = "never" to 4 = "at least once a week"). In the ReGES analyses, we include a dummy indicator for whether the child had ever attended daycare before immigration. This indicator is a proxy for knowledge of the positive effects of early preschool education on the one hand and cultural openness on the other hand.

To account for refugee-specific variables, we include return orientation as an indicator of whether respondents reported wanting to stay forever in Germany or to leave in the near future or at some point in the future (dummy). To test the effect of residence status, we split our sample into persons with a relatively secure status (recognized as refugees or as entitled to asylum) on the one hand and persons with a different protection status or persons whose application for asylum was denied on the other hand (dummy). Furthermore, we include an indicator for families that still lived in collective accommodation (dummy). In both data sets, three refugee groups are large enough to be analyzed separately: Afghans, Iraqis, and Syrians. All other groups are collapsed into the residual Other category. In this way, it is possible to control for systematic differences (e.g., other cultural differences) not covered by other covariates.

6 There is a measure for gender roles included in the ReGES data but not in all the SOEP subsamples that we use.

In the ReGES analyses, we additionally include children's PTSD risk, measured by an adaptation of the Process of Recognition and Orientation of Torture Victims in European Countries to Facilitate Care and Treatment (PROTECT) questionnaire (Boillat & Chamouton, 2013) into a rating of ten PTSD symptoms reported by their parents and included as a z-standardized factor score ($M = 0$, $SD = 1$; Cronbach's $\alpha = 0.64$).

Additional controls for the number of siblings, single-parent families, and the child's gender and age (in months) are included in both data sets.

To cope with missing data from item nonresponse, we impute missing data for all the independent variables using multiple imputations by chained equations with fully conditional specification and predictive mean matching (see Buuren, 2018). The values for the different subgroups (natives, migrants, and refugees) are imputed separately, and the data sets are combined afterward. In the resulting $m = 100$ data sets, we exclude cases with imputed outcome data and analyze them using Rubin's rules (see Rubin, 1987).

5. Results

The results for the comparison of refugees and other migrants with natives in the 0–3 age group are presented in Table 2a. In Model 2a-1, we replicate previous findings of migrants' lower daycare attendance rates, especially at this early age (-9.0 percentage points, $p < 0.05$). Furthermore, we find an even lower attendance rate for refugees (-20.4 percentage points, $p < 0.01$). In Model 2a-2, we include basic demographic and family control covariates (number of siblings, single-parent family indicator, and child's gender and age), which are important predictors and which already explain part of the differences in the attendance rates of refugees and other migrants. In Model 2a-3, we test Hypothesis 1 and include structural factors such as daycare supply, district size, and federal state dummies. In line with our expectations, these drivers largely explain the lower probabilities for migrants (which drop below the 95 percent significance level) and partially explain those for refugees. In Model 2a-4, we test Hypothesis 2 and control for socioeconomic background, which explains the remaining differences we find for refugees. However, neither families' current social status nor parental education effect the probability of daycare attendance. Only the indicator for whether the parents have never or have not yet worked in Germany is negatively associated with the probability of attending daycare. This result remains stable under control of family income (see Model 2a-5), but loses significance as soon as we control mothers' economic integration (Model 2a-6). Overall, employment of mothers has the strongest effect on attendance probability among all the variables.⁷

7 We also run analyses with mothers' working hours instead. The results were the same as those based on the dummy variable for both age groups.

The results of the comparison of refugees and other migrants with natives in the 3–6 age group are presented in Table 2b. In Model 2b-1, we also replicate previous findings of daycare attendance for this age group. As in the lower age group, migrant children have a lower attendance probability than that of natives. Notably, while the difference for migrants is less than half of that for the lower age group (-3.8 percentage points, $p < 0.05$), for refugee children, we find a similar difference in attendance probability also for the 3-to-6-year-olds (-18.2 percentage points, $p < 0.01$). In Model 2b-2, we include demographic and family controls, and in Model 2b-3, we include our structural variables to test Hypothesis 1. Unlike for the younger age group, for the older age group, these macro indicators do not substantially help to explain the differences across the three subsamples. This might be traced back to the fact that daycare supply for older children is uniformly well established.⁸ In Model 2b-4, we included our variables to measure socioeconomic background, which explain the remaining difference for the migrant group ($p > 0.05$) and nearly half of the remaining difference for the refugee group. As in the younger age group, this result is driven not by educational differences but by family income and above all different levels of mothers' labor market participation, as seen in Model 2b-5 and 2b-6. However, in contrast to the result for the younger age group, not all of the difference in attendance rates between refugees and natives for the 3-to-6-year-olds can be explained in this way.

In the next step, we examine whether migration-specific variables help explain the different daycare attendance rates among different groups of migrants. The results of the analysis of differences between migrants and refugees to test the migrant-specific hypotheses are presented in Table 3a (0-to-3-year-olds) and Table 3b (3-to-6-year-olds). The first six models each (Models 3a-1 to 3a-6 and 3b-1 to 3b-6) replicate the analyses with natives by starting with the unconditional differences among the groups and then adding the demographic, structural, and socioeconomic variables. Differences among the groups can be explained by these factors in both age groups. In the next two models each (3a-7, 3a-8, 3b-7, 3b-8), we test our hypotheses concerning migrant-specific mechanisms of daycare attendance. While we find no supporting evidence for Hypotheses 4 (language proficiency) and 6 (traditional gender attitudes), we find slight corroborating evidence for Hypothesis 5 (acquisition of host country-specific capital) in the younger age group: Children whose parents were born in Germany are more likely to attend daycare centers ($p < 0.10$).

The consideration of refugee-specific factors may provide deeper insight into aspects that may foster or hinder the daycare attendance of refugee children. The results of the analysis for the two refugee samples in the SOEP data are presented in Tables 4a and 4b. The results of the comparison of SOEP and ReGES data

8 There are, however, minor differences in daycare attendance (by up to 5–7 percentage points) between some federal states. For the younger age group, the federal state differences are even more pronounced, and attendance rates are significantly higher in most eastern states than in most western states. This is due to the historically higher daycare supply in the former German Democratic Republic (results are shown in Table A4 in the appendix).

are presented in Table 5. The models mostly show results with a set of harmonized variables. Only in Models 5-R4a, 5-6a, 5-R7a, and 5-R8 additional variables are included which are available only in the ReGES data. In the first model for each age-group (Models 4a-1, 4b-1, 5-S1, and 5-R1), we analyze unconditional differences between refugee (i.e., ethnic) groups. Over the two age groups and samples, we observe no systematic patterns between the ethnic groups. In the SOEP data on the younger age group, Iraqi children are more likely to attend daycare, while in the older age group, Afghan children are more likely to do so. In the ReGES sample, Afghan children are less likely to attend daycare than Syrian children (who are the reference group in all subsamples). However, the effects are not particularly robust and lose their statistical significance in subsequent models with additional controls. In Models 4a-3, 4b-3, 5-S4, and 5-R4, we control for structural factors that impact attendance rates. In contrast to the analysis that includes natives and other migrants, in the analyses with the refugee-only sample, the daycare attendance rate at the district level is significantly associated with refugee daycare attendance in the age group of 3-to-6-year-olds. This indicates that the supply of places in daycare centers is very important for the inclusion of refugee children. In Models 5-S3, 5-R3, and 5-R3a, we control for social origin, and we find the effects predicted by Hypothesis 2. Children with parents who had a higher class position in their country of origin and with parents who are more highly educated are more likely to attend daycare, even if these effects only display statistical significance in some of our analyses. Contrary to expectations, in both data sets, children of parents who never worked in their home countries have a higher chance of attending daycare. The question of whether this effect may be driven by young parents who want to continue their education in Germany cannot be answered at this time. With the ReGES data, we find the expected effects of migrant-specific factors in Models 5-R6 and 5-R6a. Children whose parents have higher German proficiency are more likely to attend daycare. As we use cross-sectional data, the direction of this association is unclear because parents whose children attend daycare have more contact with German-speaking children, other parents, and educators, which would in turn likely improve the parents' German proficiency. Our results also confirm the prediction of Hypothesis 5 that the longer refugees' stay in Germany, the greater is the likelihood of daycare attendance. The length of stay in Germany has a clear positive effect in both data sets. The effect, however, is statistically significant only for 3-to-6-year-olds. Last, in Models 5-S7, 5-R7, and 5-R7a, we control for refugee-specific variables. Neither legal status nor the type of accommodation has a significant impact on refugee children's probability of attending daycare. Only PTSD risk shows a significant association with daycare attendance; the positive sign contradicts the prediction of Hypothesis 7a but corroborates that of Hypothesis 7b. However, it must again be noted here that this could be driven by reversed causality, as parents might be made aware of their children's PTSD risk through interaction with preschool teachers. Furthermore, symptoms similar to those of PTSD may occur due to the stress that all children face when they transition into daycare.

Table 2a: Early daycare attendance, under-3-year-olds

Model	2a-1	2a-2	2a-3	2a-4	2a-5	2a-6
	<i>Groups</i>	<i>+Controls</i>	<i>+Structural</i>	<i>+Social</i>	<i>+Income</i>	<i>+Mother's labor market participation</i>
<i>Group (Ref.: Natives)</i>						
Migrant sample	-0.090*	-0.081*	-0.064+	-0.034	-0.022	-0.012
Refugee sample	-0.204**	-0.137**	-0.114**	0.064	0.119*	0.087
Controls						
Number of siblings		-0.039**	-0.032*	-0.018	-0.031*	-0.002
Single-parent family		-0.197**	-0.170**	-0.112*	-0.027	-0.046
Child's gender: Male (Ref.: Female)		0.003	0.015	0.011	0.013	0.026
Child's age (in months)		0.024**	0.025**	0.024**	0.024**	0.019**
Structural factors						
District size (Ref.: >500,000 inhabitants)			-0.032	-0.024	-0.023	-0.030
>100.000–500.000 inhabitants			(0.075)	(0.072)	(0.070)	(0.070)
<100.000 inhabitants			(0.058)	(0.057)	(0.057)	(0.054)
Federal state dummies included (Ref.: North Rhine-Westphalia)			Yes	Yes	Yes	Yes
Daycare attendance rate in district			0.004	0.003	0.002	0.002
Social origin						
Highest family status (HISE)				0.002	0.000	-0.000
Control: Has not worked yet in Germany				-0.138**	-0.125**	-0.075+
Highest parental education (Ref.: ISCED 0–1: Max. primary)						
ISCED 2: Secondary I				-0.103	-0.080	-0.028
ISCED 3–4: Secondary II + post-secondary				-0.074	-0.075	-0.033
ISCED 5–8: Any tertiary				-0.009	-0.039	0.008
Family income					0.076**	0.043*
Working mother (Ref.: Mother does not work)						0.318**
Control: No information on mother						0.123*
Constant	0.347**	-0.034	-0.267*	-0.299*	-0.439**	-0.400**

Data: SOEP, n = 2,108; multiple imputed data (m = 100).
Notes. + p < 0.1, * p < 0.05, ** p < 0.01; unstandardized linear regression coefficients; robust variance estimation (standard errors are shown in Table A2a in the appendix); weighted.

Table 2b: Daycare attendance, 3-to-6-year-olds

Model	2b-1 Groups	2b-2 +Controls	2b-3 +Structural	2b-4 +Social	2b-5 +Income	2b-6 +Mother's labor market participation
<i>Group (Ref.: Natives)</i>						
Migrant sample	-0.038*	-0.034*	-0.037*	-0.031+	-0.027+	-0.025+
Refugee sample	-0.182**	-0.180**	-0.175**	-0.108*	-0.093*	-0.098*
Controls						
Number of siblings		-0.010	-0.014+	-0.010	-0.013	-0.008
Single-parent family		0.004	-0.000	0.018	0.041*	0.033+
Child's gender: Male (Ref.: Female)		0.009	0.007	0.005	0.006	0.007
Child's age (in months)		0.002**	0.002**	0.002**	0.002**	0.002**
Structural factors						
District size (Ref.: >500,000 inhabitants)						
>100.000–500.000 inhabitants			-0.061*	-0.068*	-0.066*	-0.065*
<100.000 inhabitants			-0.039**	-0.043**	-0.044**	-0.046**
Federal state dummies included (Ref.: North Rhine-Westphalia)			Yes	Yes	Yes	Yes
Daycare attendance rate in district			-0.002	-0.002	-0.003	-0.003
Social origin						
Highest family status (HISEI)				0.000	-0.000	-0.000
Control: Has not worked yet in Germany				-0.051	-0.049	-0.029
<i>Highest parental education (Ref.: ISCED 0–1: max. primary)</i>						
ISCED 2: Sek I				0.061	0.066	0.069
ISCED 3–4: Sek II + postsecondary				0.059	0.057	0.060
ISCED 5–8: any tertiary				0.073	0.065	0.070
Family income					0.019*	0.016+
Working mother (Ref.: Mother does not work)						0.038+
Control: No information on mother						0.022
Constant	0.979**	0.879**	1.088**	1.018**	1.010**	0.999**

Data: SOEP, n = 2,039; multiple imputed data (m = 100).

Notes. + p < 0.1, * p < 0.05, ** p < 0.01; unstandardized linear regression coefficients; robust variance estimation (standard errors are shown in Table A2b in the appendix); weighted.

Table 3a: Early daycare attendance of migrants and refugees, under-3-year-olds

Model	3a-1	3a-2	3a-3	3a-4	3a-5	3a-6	3a-7	3a-8
	Groups	+Controls	+Struc- tural	+Social	+Income	+Mother's labor market participation	+Language skills	+all migrant- specifics
Group (Ref.: Migrants)								
Refuge sample	-0.113**	-0.061*	-0.046	0.091	0.117+	0.092	0.078	0.074
Controls								
Number of siblings		-0.035*	-0.031+	-0.016	-0.030	-0.008	-0.007	-0.011
Single-parent family		-0.214**	-0.182**	-0.151**	-0.083	-0.088	-0.089	-0.073
Child's gender: Male (Ref.: Female)		-0.025	-0.028	-0.039	-0.040	-0.011	-0.015	-0.016
Child's age (in months)		0.023**	0.023**	0.023**	0.022**	0.019**	0.019**	0.019**
Structural factors								
District size (Ref.: >500,000 inhabitants)								
>100.000–500.000 inhabitants			-0.087	-0.065	-0.074	-0.061	-0.064	-0.068
<100.000 inhabitants			-0.128+	-0.117+	-0.135*	-0.117+	-0.128*	-0.129*
Federal state dummies included (Ref.: North Rhine- Westphalia)								
Daycare attendance rate in district			0.004	0.003	0.002	0.005	0.004	0.004
Social origin								
Highest family status (HISEI)				0.003+	0.001	0.001	0.001	0.001
Control: Has not worked yet in Germany				-0.055	-0.043	-0.027	-0.035	-0.041
Highest parental education (Ref.: ISCED 0–1: max. primary)								
ISCED 2: Sek I				-0.123	-0.108	-0.073	-0.051	-0.051
ISCED 3–4: Sek II + postsecondary				-0.110	-0.108	-0.072	-0.061	-0.068
ISCED 5–8: any tertiary				-0.015	-0.032	0.012	0.021	0.007
Family income					0.065**	0.037	0.038+	0.044+
Working mother (Ref.: Mother does not work)						0.262**	0.262**	0.255**
Control: No information on mother						0.091	0.090	0.092

Table 3a continued

Table 3a continued

Model	3a-1	3a-2	3a-3	3a-4	3a-5	3a-6	3a-7	3a-8
	Groups	+Controls	+Structural	+Social	+Income	+Mother's labor market participation	+Language skills	+all migrant-specifics
Migrant-specific								
Mother's German language proficiency							-0.012	-0.009
Father/partner's German language proficiency							-0.038	-0.040
Parent is 1. Generation migrant								0.081+
Control: Parent born in Germany								-0.002
Other language use at home (<i>Ref.: German</i>)								-0.067
Attendance of religious gatherings								-0.005
Constant	0.257**	-0.076	-0.170	-0.215	-0.282	-0.353*	-0.334*	-0.326+

Data: SOEP, n = 1,536; multiple imputed data (m = 100).

Notes. + p < 0.1, * p < 0.05, ** p < 0.01; unstandardized linear regression coefficients; robust variance estimation (standard errors are shown in Table A3a in the appendix); weighted.

Table 3b: Daycare attendance of migrants and refugees, 3-to-6-year-olds

Model	3b-1	3b-2	3b-3	3b-4	3b-5	3b-6	3b-7	3b-8
	Groups	+Controls	+Struc- tural	+Social	+Income	+Mother's labor market participation	+Language skills	+all migrant- specifics
<i>Group (Ref.: Migrants)</i>								
Refugee sample	-0.144**	-0.148**	-0.134**	-0.071	-0.057	-0.063	-0.057	-0.034
Controls								
Number of siblings		-0.018	-0.023+	-0.015	-0.021	-0.015	-0.015	-0.017
Single-parent family		0.004	-0.008	0.024	0.052	0.034	0.034	0.029
Child's gender: Male (Ref.: Female)		0.029	0.020	0.019	0.025	0.029	0.025	0.015
Child's age (in months)		0.004**	0.004**	0.004**	0.004**	0.004**	0.004**	0.004**
Structural factors								
District size (Ref.: >500,000 inhabitants)								
>100.000–500.000 inhabitants			-0.090	-0.100+	-0.092+	-0.097+	-0.093+	-0.090+
<100.000 inhabitants			-0.055*	-0.063*	-0.063*	-0.068*	-0.070*	-0.071*
<i>Federal state dummies included (Ref.: North Rhine- Westphalia)</i>								
Daycare attendance rate in district			-0.001	-0.001	-0.002	-0.002	-0.003	-0.004
Social origin								
Highest family status (HISEI)				0.000	-0.000	-0.000	-0.000	-0.001
Control: Has not worked yet in Germany				-0.052	-0.051	-0.020	-0.026	-0.033
<i>Highest parental education (Ref.: ISCED 0–1: max. primary)</i>								
ISCED 2: Sek I				0.030	0.033	0.037	0.040	0.023
ISCED 3–4: Sek II + postsecondary				0.037	0.037	0.039	0.037	0.024
ISCED 5–8: any tertiary				0.059	0.049	0.054	0.053	0.043
Family income					0.026+	0.022	0.027+	0.023
Working mother (Ref.: Mother does not work)						0.071*	0.065*	0.067*
Control: No information on mother						0.010	0.013	0.006

Table 3b continued

Table 3b continued

Model	3b-1	3b-2	3b-3	3b-4	3b-5	3b-6	3b-7	3b-8
	Groups	+Controls	+Structural	+Social	+Income	+Mother's labor market participation	+Language skills	+all migrant-specifics
Migrant-specific								
Mother's German language proficiency							0.015	0.020
Father/partner's German language proficiency							-0.029	-0.017
Parent is 1. Generation migrant								0.029
Control: Parent born in Germany								0.061
Other language use at home (<i>Ref.: German</i>)								-0.056
Attendance of religious gatherings								-0.020
Constant	0.942**	0.755**	0.865*	0.819*	0.862*	0.824*	0.847*	1.045*

Data: SOEP, n = 1,398; multiple imputed data (m = 100).

Notes: + p < 0.1, * p < 0.05, ** p < 0.01; unstandardized linear regression coefficients; robust variance estimation (standard errors are shown in Table A3b in the appendix); weighted.

Table 4a: Early daycare attendance of refugees, under-3-year-olds

Model	4a-1	4a-2	4a-3	4a-4	4a-5	4a-6	4a-7	4a-8
	Groups	+Controls	+Struc- tural	+Social	+Income	+Mother's labor market participation	+Migrant- specifics	+Refugee- specifics
<i>Origin (Ref.: Syria)</i>								
Afghanistans	0.135	0.147	0.083	0.105	0.102	0.124	0.095	0.069
Iraq	0.338*	0.326*	0.294+	0.306+	0.309+	0.332*	0.309+	0.310+
Other	-0.045	0.112	0.071	0.065	0.064	0.078	-0.001	-0.013
Controls								
Number of siblings		-0.021+	-0.025*	-0.021+	-0.017	-0.018	-0.015	-0.017
Single-parent family		0.024	0.049	0.076	0.066	0.032	0.020	0.006
Child's gender: Male (Ref.: Female)		0.042	0.055+	0.056+	0.056+	0.050+	0.051+	0.052+
Child's age (in months)		0.011**	0.012**	0.012**	0.012**	0.012**	0.012**	0.012**
Structural factors								
<i>District size (Ref.: >500,000 inhabitants)</i>								
>100.000–500.000 inhabitants			-0.087	-0.086	-0.085	-0.072	-0.070	-0.059
<100.000 inhabitants			0.012	0.005	0.006	0.009	0.008	0.012
<i>Federal state dummies included (Ref.: NRW)</i>			Yes	Yes	Yes	Yes	Yes	Yes
Daycare attendance quota in district			-0.000	0.000	0.001	0.000	-0.000	-0.001
Social origin								
Highest family status (HISEI)				0.001	0.001	0.001	0.001	0.001
Control: Has not worked yet in Germany				-0.003	-0.007	0.029	0.027	0.040
<i>Highest parental education (Ref.: ISCED 0–1: max. primary)</i>								
ISCED 2: Sek I				0.048	0.049	0.038	0.034	0.021
ISCED 3–4: Sek II + postsecondary				0.052	0.054	0.041	0.036	0.018
ISCED 5–8: any tertiary				0.102*	0.104*	0.091*	0.079	0.051
Family income					-0.021	-0.014	-0.018	-0.012
Working mother (Ref.: Mother does not work)						0.547**	0.532**	0.537**
Control: No information on mother						-0.081**	-0.096**	-0.099**

Table 4a continued

Table 4a continued

Model	4a-1	4a-2	4a-3	4a-4	4a-5	4a-6	4a-7	4a-8
	Groups	+Controls	+Structural	+Social	+Income	+Mother's labor market participation	+Migrant-specifics	+Refugee-specifics
Migrant-specific								
Mother's German language proficiency							0.020	0.020
Father/partner's German language proficiency							-0.002	-0.002
Contact to Germans							0.015+	0.013+
Child born in Germany							0.254+	0.270+
Years since migration							0.146	0.150
Other language use at home (<i>Ref.: German</i>)							-0.001	-0.005
Attendance of religious gatherings							0.008	0.005
Refugee-specific								
Return orientation (<i>Ref.: No</i>)								0.026
Accommodation: collective (<i>Ref.: Private</i>)								-0.053
Legal status: insecure (<i>Ref.: Secure</i>)								-0.001
Constant	0.172 **	-0.143+	-0.114	-0.174	-0.147	-0.161	-0.316+	-0.275

Data: SOEP, n = 1,004; multiple imputed data (m = 100).

Notes. + p < 0.1, * p < 0.05, ** p < 0.01; unstandardized linear regression coefficients; robust variance estimation (standard errors are shown in Table A4a in the appendix); weighted.

Table 4b: Daycare attendance of refugees, 3-to-6-year-olds

Model	4b-1	4b-2	4b-3	4b-4	4b-5	4b-6	4b-7	4b-8
	Groups	+Controls	+Structural	+Social	+Income	+Mother's labor market participation	+Migrant-specific	+Refugee-specific
<i>Origin (Ref.: Syria)</i>								
Afghanistan	0.096*	0.099*	0.095*	0.088+	0.087+	0.082+	0.080+	0.095+
Iraq	0.015	0.010	0.020	0.031	0.029	0.037	0.051	0.063
Other	0.016	0.002	0.059	0.039	0.035	0.023	0.021	0.047
Controls								
Number of siblings		-0.017	-0.012	-0.009	-0.007	-0.003	-0.003	-0.005
Single-parent family		0.047	0.022	0.034	0.030	0.002	-0.015	-0.015
Child's gender: Male (Ref.: Female)		-0.032	-0.039	-0.039	-0.038	-0.035	-0.028	-0.031
Child's age (in months)		0.009**	0.009**	0.009**	0.009**	0.009**	0.008**	0.008**
Structural factors								
<i>District size (Ref.: >500,000 inhabitants)</i>								
>100.000–500.000 inhabitants			0.057	0.066	0.066	0.053	0.016	0.027
<100.000 inhabitants			0.046	0.051	0.050	0.038	0.002	0.013
<i>Federal state dummies included (Ref.: NRW)</i>			Yes	Yes	Yes	Yes	Yes	Yes
Daycare attendance rate in district			0.024**	0.023**	0.023**	0.022**	0.019**	0.019**
Social origin								
Highest family status (HISEI)				0.002	0.002	0.002	0.001	0.001
Control: Has not worked yet in Germany				-0.041	-0.042	-0.026	-0.052	-0.037
<i>Highest parental education (Ref.: ISCED 0–1: max. primary)</i>								
ISCED 2: Sek I				-0.042	-0.041	-0.042	-0.051	-0.053
ISCED 3–4: Sek II + postsecondary				0.068	0.068	0.058	0.015	0.013
ISCED 5–8: any tertiary				-0.017	-0.016	-0.014	-0.050	-0.055
Family income					-0.009	-0.009	-0.011	-0.008
Working mother (Ref.: Mother does not work)					0.124	0.124	0.024	0.032
Control: No information on mother					-0.102*	-0.102*	-0.116**	-0.119**

Table 4b continued

Table 4b continued

Model	4b-1	4b-2	4b-3	4b-4	4b-5	4b-6	4b-7	4b-8
	Groups	+Controls	+Structural	+Social	+Income	+Mother's labor market participation	+Migrant-specific	+Refugee-specific
Migrant-specific								
Mother's German language proficiency							0.039	0.033
Father/partner's German language proficiency							0.040	0.038
Years since migration							0.074**	0.071**
Other language use at home (<i>Ref.: German</i>)							-0.080	-0.078
Attendance of religious gatherings							0.005	0.001
Refugee-specific								
Return orientation (<i>Ref.: No</i>)								0.133
Contact to Germans								0.009
Accommodation: collective (<i>Ref.: Private</i>)								0.011
Legal status: insecure (<i>Ref.: Secure</i>)								-0.019
Constant	0.775**	0.316*	-1.954**	-1.850**	-1.832**	-1.756**	-1.375*	-1.415*

Data: SOEP, n = 932; multiple imputed data (m = 100).

Notes. + p < 0.1, * p < 0.05, ** p < 0.01; unstandardized linear regression coefficients; robust variance estimation (standard errors are shown in Table A4b in the appendix); weighted.

Table 5: Daycare attendance of refugees SOEP-ReGES

Data		SOEP (3–6)							ReGES										
Model		5-S1	5-S2	5-S3	5-S4	5-S5	5-S6	5-S7	5-R1	5-R2	5-R3	5-R4	5-R4a	5-R5	5-R6	5-R6a	5-R7	5-R7a	5-R8
Country of Origin (Ref.: Syria)																			
Afghanistan	0.096*	0.099*	0.095*	0.091+	0.088+	0.087+	0.112*	-0.065*	-0.064*	-0.050+	-0.042	-0.037	-0.042	-0.042	-0.028	-0.027	-0.03	-0.031	-0.027
Iraq	0.015	0.010	0.020	0.027	0.033	0.043	0.060	-0.024	-0.025	-0.057+	-0.042	-0.04	-0.042	-0.042	-0.053+	-0.051	-0.056+	-0.066*	-0.062+
Other	0.016	0.002	0.059	0.046	0.030	0.051	0.080	0.025	0.022	0.007	0.007	0.007	0.001	0.008	-0.014	-0.017	-0.018	-0.019	-0.026
Controls																			
Number of siblings		-0.017	-0.012	-0.009	-0.004	-0.004	-0.006	-0.006		-0.008	-0.010+	-0.007	-0.006	-0.007	-0.006	-0.006	-0.006	-0.006	-0.005
Single parent		0.047	0.022	0.022	0.022	-0.010	-0.014	-0.007		-0.024	-0.024	-0.025	-0.023	-0.025	-0.022	-0.023	-0.022	-0.023	-0.023
Child's gender: male (Ref.: Female)		-0.032	-0.039	-0.031	-0.029	-0.030	-0.030	-0.030		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Child's age (in months)		0.009**	0.009**	0.009**	0.009**	0.009**	0.008**	0.008**		-0.064*	-0.050+	-0.042	-0.037	-0.042	-0.028	-0.027	-0.03	-0.031	-0.027
Structural factors																			
District size (Ref.: >500.000 inhabitants)																			
>100.000–500.000 inhabitants		0.057	0.064	0.054	0.054	0.054	0.026	0.034		0.089**	0.085**	0.085**	0.085**	0.085**	0.087**	0.086**	0.088**	0.089**	0.089**
<100.000 inhabitants		0.046	0.049	0.038	0.038	0.038	0.009	0.018		0.019	0.024	0.024	0.017	0.024	0.019	0.019	0.018	0.019	0.015
Federal state dummies included (Ref.: NRW)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Daycare attendance rate in district		0.024**	0.023**	0.023**	0.023**	0.023**	0.018**	0.019**		0.013**	0.012**	0.012**	0.012**	0.012**	0.010**	0.010**	0.010**	0.010**	0.010**
Social origin																			
Highest parental education (Ref.: ISCED 0–1: Max. primary)																			
ISCED 2: Sek I		-0.040	-0.040	-0.040	-0.045	-0.045	-0.046				0.036	0.031	0.031	0.036	0.021	0.02	0.022	0.022	0.018
ISCED 3–4: Sek II + postsecondary		0.080	0.070	0.021	0.021	0.021	0.023				0.03	0.019	0.03	0.03	0.008	0.007	0.008	0.007	-0.002
ISCED 5–8: any tertiary		-0.009	-0.002	-0.053	-0.053	-0.053	-0.059				0.053+	0.035	0.035	0.053+	0.022	0.022	0.023	0.022	0.009
Highest family status in home country		0.000	-0.000	-0.000	-0.000	-0.000	0.000				0.001*	0.001*	0.001	0.001*	0.001	0.001	0.001	0.001	0.001
Control: Did not work in home country							0.043												
Books at home Country of Origin																			
Working mother (Ref.: Mother does not work)																			
Control: No information on mother																			

Table 5 continued

Table 5 continued

Data	SOEP (3–6)							ReGES										
Model	5-S1	5-S2	5-S3	5-S4	5-S5	5-S6	5-S7	5-R1	5-R2	5-R3	5-R4	5-R4a	5-R5	5-R6	5-R6a	5-R7	5-R7a	5-R8
Migrant-specific																		
German proficiency, mother					0.037	0.036								0.023*	0.023*	0.023*	0.024*	0.023*
German proficiency, father/partner					0.040	0.040								0.046**	0.046**	0.047**	0.047**	0.045**
Years since migration					0.069**	0.067**								0.068**	0.069**	0.068**	0.067**	0.067**
Contact to Germans					0.013	0.012								0.006	0.006	0.006	0.005	0.006
Religiosity					-0.024	-0.025								-0.005	-0.005	-0.004	-0.005	-0.006
Daycare attendance in home country															0.042+			0.038+
Refugee-specific																		
Legal status: insecure (<i>Ref.: Secure</i>)						0.138										-0.009	-0.01	-0.009
Accommodation: collective (<i>Ref.: private</i>)						0.017										0.011	0.006	0.006
Return orientation: yes (<i>Ref.: No</i>)						-0.023										-0.023	-0.025	-0.024
PTSD risk																	0.024*	0.023*
Constant	0.775**	0.316*	-1.95**	-1.90**	-1.84**	-1.40*	-1.50*	0.837**	0.858**	-0.255	-0.311	-0.334	-0.311	-0.241	-0.217	-0.253	-0.208	-0.214

Data: SOEP, n = 932; ReGES, n = 2,183; multiple imputed data (m = 100).

Notes. + p < 0.1 * p < 0.05 ** p < 0.01; unstandardized linear regression coefficients, robust variance estimation (standard errors are shown in Table A5 in the appendix); SOEP results weighted.

6. Summary and discussion

This article aimed to shed further light on the structural integration of refugee children into the German educational system by comparing refugee children's daycare attendance with that of other children in Germany. Furthermore, we used two unique data sets to analyze differences in the daycare attendance of refugee children of different ages for the first time.

The first important result is that refugee children do attend daycare centers, even though their daycare attendance rates are still lower than those of non-migrant children and children from other types of migrant families. The second important result is that these inequalities can be explained by socioeconomic, cultural, and structural factors known from the literature. Lastly, we showed that refugee-specific factors do not have an important impact on daycare attendance.

For the 0-to-3-years age group, the differences in the attendance rates of refugees can be explained mainly by socioeconomic indicators. In particular, their mothers' labor market participation increases children's probability of attending a daycare center. At a policy level, our findings indicate the importance of rapid labor market integration of refugee families. Especially for the age group of under-3-year-olds, labor market integration can be seen as the key factor for daycare attendance. Differences between refugees and other migrants can be explained by structural factors, while migrant- and refugee-specific factors play only a minor role in explaining differences between refugees and other migrants as well as between refugee groups.

For the age group of 3-to-6-year-old children, socioeconomic factors are central for the explanation of differences in daycare attendance among the three observed groups. Mothers' employment again shows the strongest association. In contrast to the younger age group, structural factors and migration-specific factors, years since migration in particular, are important predictors for daycare attendance of refugees and other migrants. Also, we find only minor influences of refugee-specific factors, which is a very important result: neither refugees' legal status nor their type of accommodation has a significant influence on their participation in preschool education.

For future research, it is important to take a closer look at the factors which influence how long it takes refugee children to enroll in a daycare center. Statements from daycare directors suggest that the support of specialist staff and volunteers plays a major role here (see Baisch et al., 2017). Besides, however, we found a great influence of structural factors that is more prominent for refugee children than for this age group in general. Especially in districts with an ample supply of daycare places, the probability of enrolling in a daycare center was significantly higher. This indicates that it is especially important for refugees to have access to a sufficient supply of daycare places.

There are, however, some limitations to our current findings. First, refugees who have not yet been assigned to a host community are not included in the ReGES sample and probably are less likely to have been included in the SOEP sur-

vey; the results should therefore not be hastily generalized to refugees who still live in initial reception facilities or AnKER centers. Second, at this point, our study design is cross-sectional, which precludes certain insights (e.g., on the causal relationship between parents' German language proficiency and daycare attendance). In further studies, it will be possible to use longitudinal data from both the SOEP and the ReGES study to address some of these current limitations.

Lastly, the question of whether refugee status should be regarded as a separate dimension of inequality remains not satisfactorily answered yet. For refugees who live in Germany for some time and who are allocated to municipalities, the same social mechanisms explain most of the educational differences between them, other migrants, and non-migrants in early and preschool age. To explain the remaining differences between these groups and within the refugee population, it is necessary to integrate refugee-specific conditions into our theoretical models. This may be especially important for special refugee groups like those in AnKER centers.

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Table A1: Descriptives by (sub)sample

Data	SOEP 0-3			SOEP 3-6			ReGES	
	Group (Ref. Natives)	Migrant sample	Refugee sample	Group (Ref. Natives)	Migrant sample	Refugee sample	Refugee sample	RC1
Subgroup								
n ⁺	572	532	1,004	641	466	932	2,183	
Preschool attendance in % (S.E.)	35.3 (2.0)	26.2 (1.9)	13.4 (1.1)	98.3 (0.5)	94.3 (1.1)	79.1 (1.3)	82.7 (0.4)	
Controls								
Number of siblings								
Mean (S.E.)	1.0 (0.0)	1.0 (1.1)	1.5 (0.0)	1.0 (0.0)	1.1 (0.0)	2.0 (0.0)	2.1 (0.0)	
SD (S.E.)	1.0 (0.1)	1.2 (0.1)	1.3 (0.0)	1.0 (1.0)	1.0 (0.1)	1.4 (0.0)	1.7 (0.2)	
Missing in %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Single-parent family (Ref.: No)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	
Yes	6.1 (1.0)	7.1 (1.1)	12.6 (1.0)	12.7 (1.3)	12.1 (1.5)	11.6 (1.1)	0.0 (0.0)	
Missing in %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Child's gender (Ref.: Female)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	
Male	47.5 (2.2)	55.2 (2.2)	45.2 (1.6)	54.3 (2.0)	48.6 (2.3)	53.9 (1.6)	52.9 (0.0)	
Missing in %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Child's age (in months)								
Mean (S.E.)	18.2 (0.4)	17.8 (0.4)	16.3 (0.3)	52.3 (0.4)	51.3 (0.5)	55.7 (0.4)	66.3 (0.2)	
SD (S.E.)	10.7 (0.2)	9.9 (0.2)	10.2 (0.2)	10.2 (0.2)	9.9 (0.2)	10.9 (0.2)	7.6 (0.1)	
Missing in %	18.9	10.3	58.4	25.7	20.5	84.0	0	
Structural factors								
District size	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	
>100,000 inhabitants	72.9 (1.9)	56.7 (2.2)	63.7 (1.5)	74.5 (1.7)	67.2 (2.2)	63.2 (1.6)	9.0 (1.0)	
>100,000-500,000 inhabitants	12.9 (1.4)	16.1 (1.6)	19.1 (1.2)	12.9 (1.3)	15.5 (1.7)	20.2 (1.3)	30.5 (1.0)	
<500,000 inhabitants	14.3 (1.5)	27.2 (1.9)	17.2 (1.2)	12.6 (1.3)	17.3 (1.8)	16.6 (1.2)	60.6 (1.0)	
Missing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Federal state	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	
Baden-Wuerttemberg	10.5 (1.3)	21.7 (1.8)	9.4 (0.9)	10.7 (1.2)	21.8 (1.9)	11.2 (1.0)	0.0	
Bavaria	18.6 (1.6)	18.5 (1.7)	15.1 (1.1)	14.4 (1.4)	16.0 (1.7)	12.8 (1.1)	8.2 (0.6)	
Berlin	4.1 (0.8)	3.5 (0.8)	3.3 (0.6)	3.4 (0.7)	3.7 (0.9)	3.8 (0.6)	0.0	

Table A1 continued

Table A1 continued

Brandenburg	3.8 (0.8)	1.6 (0.5)	3.6 (0.6)	4.7 (0.8)	0.9 (0.4)	3.6 (0.6)	0.0
Bremen	0.0	2.0 (0.6)	2.2 (0.5)	0.0	1.1 (0.5)	2.5 (0.5)	0.0
Hamburg	1.4 (0.5)	4.0 (0.9)	2.3 (0.5)	3.1 (0.7)	2.3 (0.7)	1.6 (0.4)	13.1 (1.0)
Hesse	7.6 (1.1)	9.3 (1.3)	7.0 (0.8)	6.8 (1.0)	10.2 (1.4)	6.6 (0.8)	0.0
Mecklenburg-Pomerania	2.5 (0.7)	0.5 (0.3)	1.9 (0.4)	3.0 (0.7)	0.4 (0.3)	0.5 (0.2)	0.0
Lower Saxony	11.0 (1.3)	7.0 (1.1)	13.0 (1.1)	9.6 (1.2)	8.1 (1.3)	10.5 (1.0)	0.0
North Rhine-Westphalia	17.0 (1.6)	20.6 (1.8)	26.5 (1.4)	19.4 (1.6)	21.0 (1.9)	27.7 (1.5)	62.6 (1.0)
Rhineland-Palatinate	2.0 (0.6)	4.9 (0.9)	3.8 (0.6)	3.6 (0.7)	6.8 (1.2)	4.6 (0.7)	7.1 (0.1)
Saarland	1.3 (0.5)	0.2 (0.2)	1.5 (0.4)	1.7 (0.5)	1.4 (0.5)	1.6 (0.4)	0.0
Saxony	7.8 (1.1)	0.8 (0.4)	2.8 (0.5)	6.0 (0.9)	1.9 (0.6)	4.1 (0.7)	9.2 (0.0)
Saxony-Anhalt	3.9 (0.8)	1.1 (0.5)	2.9 (0.5)	3.6 (0.7)	0.2 (0.2)	3.7 (0.6)	0.0
Schleswig-Holstein	4.0 (0.98)	2.2 (0.6)	3.4 (0.6)	5.7 (0.9)	3.1 (0.8)	3.1 (0.6)	0.0
Thuringia	4.5 (0.9)	2.0 (0.6)	1.2 (0.3)	4.3 (0.8)	1.1 (0.5)	2.2 (0.5)	0.0
Missing	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Daycare attendance rate in district							
Mean (S.E.)	33.4 (0.5)	30.8 (0.4)	30.8 (0.3)	90.7 (0.1)	90.3 (0.1)	90.3 (0.1)	87.5 (0.1)
SD (S.E.)	12.2 (0.3)	8.7 (0.4)	10.2 (0.3)	12.0 (0.3)	7.8 (0.4)	10.7 (0.3)	3.7 (0.1)
Missing in %	4.5	3.5	3.8	3.7	3.7	4.8	32.4

Social origin

Highest family status in Germany (HISEI)

Min. / max.	16/88	16/88	16/85	17/90	16/88	16/80	n/a
Mean (S.E.)	57.3 (1.4)	48.1 (1.7)	33.1 (4.4)	57.6 (1.6)	49.5 (1.9)	31.8 (4.0)	n/a
SD (S.E.)	17.6 (0.5)	18.7 (0.6)	16.3 (2.1)	16.5 (0.6)	18.7 (0.8)	17.1 (2.2)	n/a
Has not worked yet in Germany (in %, (S.E.))	6.0 (1.0)	9.6 (1.3)	86.6 (1.1)	3.8 (0.8)	10.4 (1.4)	84.4 (1.2)	n/a
Missing in %	0.2	0.7	7.5	0.7	1.0	7.5	n/a
Highest family status in country of origin (HISEI)							
Min. / max.	n/a	n/a	16/88	n/a	n/a	16/88	11.7/88.7
Mean (S.E.)	n/a	n/a	50.2 (6.9)	n/a	n/a	52.1 (7.0)	47.7 (0.8)
SD (S.E.)	n/a	n/a	17.8 (1.1)	n/a	n/a	18.3 (1.2)	23.8 (0.3)
Has not worked (in %, (S.E.))	n/a	n/a	9.4 (0.9)	n/a	n/a	0.7 (0.9)	19.3
Missing in %	n/a	n/a	54.4	n/a	n/a	56.9	10.3

Table A1 continued

Table A1 continued

Highest parental education (HISCED)									
ISCED 0-1: Max. primary	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)
ISCED 2: Secondary I	0.4 (0.3)	2.9 (0.8)	35.8 (1.7)	0.3 (0.2)	3.2 (0.9)	35.3 (1.8)	36.8 (1.1)		
ISCED 3-4: Secondary II + post-secondary	3.5 (0.8)	9.3 (1.3)	20.3 (1.4)	6.8 (1.0)	7.1 (1.4)	22.1 (1.6)	13.7 (0.8)		
ISCED 5-8: Any tertiary	41.8 (2.1)	39.0 (2.2)	25.6 (1.5)	41.3 (2.0)	44.3 (2.4)	19.7 (1.5)	23.3 (1.0)		
Missing in %	54.3 (2.1)	48.8 (2.2)	18.3 (1.3)	51.7 (2.0)	45.4 (2.4)	22.9 (1.5)	26.2 (1.0)		
Books at home in country of origin	1.2	2.1	9.4	1.2	2.4	9.8	28.8		
0 = 0-10 books	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)		
1 = 11-25 books	n/a	n/a	n/a	n/a	n/a	n/a	56.2 (1.1)		
2 = 26-100 books	n/a	n/a	n/a	n/a	n/a	n/a	18.9 (0.9)		
3 =101 and more books	n/a	n/a	n/a	n/a	n/a	n/a	15.8 (0.8)		
Missing	n/a	n/a	n/a	n/a	n/a	n/a	9.1 (0.6)		
Family income (<i>monthly</i>)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)		
0 = < 1,000 €	0.9 (0.4)	1.5 (0.5)	34.2 (1.6)	1.7 (0.6)	1.9 (0.7)	21.2 (1.4)	n/a		
1 = 1,000–2,000€	10.9 (1.3)	20.9 (1.8)	57.8 (1.7)	13.2 (1.4)	23.0 (2.0)	66.0 (1.6)	n/a		
2 = 2,000–3,000€	25.3 (1.9)	34.7 (2.1)	7.5 (0.9)	20.5 (1.7)	25.2 (2.0)	11.7 (1.1)	n/a		
3 = 3,000–4,000€	36.2 (2.1)	19.3 (1.8)	0.5 (0.2)	27.4 (1.9)	21.5 (1.9)	1.1 (0.4)	n/a		
4 = > 4,000€	26.6 (1.9)	23.6 (1.9)	0.1 (0.1)	37.2 (2.0)	28.5 (2.1)	0.0 (0.0)	n/a		
Missing	4.9	3.8	7.4	3.0	5.3	6.2	n/a		
Working mother	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)		
Yes	36.2 (2.0)	26.9 (1.9)	0.7 (0.3)	64.8 (1.9)	59.0 (2.3)	2.9 (0.5)	3.4 (0.4)		
No	55.4 (2.1)	67.2 (2.0)	73.0 (1.4)	22.7 (1.7)	36.8 (2.2)	71.8 (1.5)	96.6 (0.4)		
No mother in household*	8.4 (1.2)	5.9 (1.0)	26.3 (1.4)	12.5 (1.3)	4.2 (0.9)	25.3 (1.4)	0.0		
Missing	0.0	0.0	0.0	0.0	0.0	0.0	63.7		
Mother's weekly working hours	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)		
Mother does not work	55.4 (2.1)	67.2 (2.0)	73.0 (1.4)	22.7 (1.7)	36.8 (2.2)	71.8 (1.5)	96.6 (0.4)		
0-20h	17.1 (1.6)	16.7 (1.7)	0.2 (0.1)	24.7 (1.8)	24.4 (2.3)	2.4 (0.6)	n/a		
>20-30h	12.4 (1.4)	5.9 (1.1)	0.0	21.8 (1.7)	19.0 (2.2)	0.0	n/a		
>30h	6.7 (1.1)	4.2 (0.9)	0.5 (0.2)	18.3 (1.6)	15.7 (2.2)	0.5 (0.4)	n/a		
No mother in household*	8.4 (1.2)	5.9 (1.0)	26.3 (1.4)	12.5 (1.3)	4.2 (0.9)	25.3 (1.4)	0.0		
Missing	3.7	3.0	0.0	7.6	7.5	0.8	n/a		

Table A1 continued

Table A1 continued

Migrant-specific									
Mother's German language proficiency									
Min. / max.	n/a	-1.5/1.6	-1.5/1.6	n/a	-1.4/1.6	-1.5/1.6	-2.0/2.1		
Mean (S.E.)	n/a	0.8 (0.0)	-0.5 (0.0)	n/a	0.9 (0.0)	-0.4 (0.0)	0.0 (0.0)		
SD (S.E.)	n/a	0.7 (0.0)	0.7 (0.0)	n/a	0.8 (0.0)	0.8 (0.0)	1.0 (0.0)		
No mother in household* (in %, (S.E.))									
No information because of filtering in questionnaire	n/a	5.9 (1.0)	26.3 (1.4)	n/a	4.2 (0.9)	25.3 (1.4)	0.0		
Missing in %	n/a	30.3 (2.0)	0.0	n/a	31.5 (2.2)	0.0	0.0		
Father/Partner's German language proficiency									
Min. / max.	n/a	-2.0/1.7	-2.0/1.7	n/a	-1.9/1.7	-2.0/1.7	-2.9/2.0		
Mean (S.E.)	n/a	0.7 (0.1)	-0.3 (0.1)	n/a	0.7 (0.1)	-0.3 (0.0)	0.0 (0.0)		
SD (S.E.)	n/a	0.9 (0.0)	0.9 (0.0)	n/a	1.0 (0.0)	0.9 (0.0)	1.0 (0.0)		
No father in household* (in %, (S.E.))									
No information because of filtering in questionnaire	n/a	23.1 (1.8)	29.7(1.4)	n/a	28.1 (2.1)	29.9 (1.5)	0.0		
Missing in %	n/a	28.8 (2.0)	0.0	n/a	25.9 (2.0)	0.0	0.0		
Years since migration									
Mean (S.E.)	n/a	n/a	1.1 (0.1)	n/a	n/a	1.8 (0.0)	1.8 (0.0)		
SD (S.E.)	n/a	n/a	0.6 (0.1)	n/a	n/a	0.9 (0.0)	0.8 (0.0)		
Missing in %	n/a	n/a	0.7	n/a	n/a	1.3	0.0		
Child born in Germany (Ref.: No)									
Yes	100.0	100.0	87.8 (1.0)	100.0	100.0	0.0	0.0 (0.0)		
Missing	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Country of origin									
Afghanistan	0.0 (0.0)	0.0 (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)		
Iraq	0.0 (0.0)	0.0 (0.0)	1.4 (0.4)	0.0 (0.0)	0.0 (0.0)	16.9 (1.2)	9.2 (0.6)		
Syria	0.0 (0.0)	0.0 (0.0)	2.6 (0.5)	0.0 (0.0)	0.0 (0.0)	12.1 (1.1)	13.4 (0.7)		
Other	0.0 (0.0)	0.0 (0.0)	6.1 (0.8)	0.0 (0.0)	0.0 (0.0)	44.8 (1.6)	73.7 (1.0)		
Missing	100.0 (0.0)	100.0 (0.0)	89.9 (1.0)	100.0 (0.0)	100.0 (0.0)	26.3 (1.4)	3.7 (0.4)		
	0.0	0.0	0.0	0.0	0.0	0.0	1.8		

Table A1 continued

Table A1 continued

Parent 1st-gen. migrant (Ref.: No)									
Yes	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)
	n/a	60.2 (2.1)	100.0 (0.0)	n/a	60.2 (2.3)	100.0 (0.0)	100.0 (0.0)	100.0 (0.0)	100.0 (0.0)
Parent born in Germany	% (S.E.)	15.5 (1.6)	0.0	n/a	24.3 (2.0)	0.0	0.0	0.0	0.0
Missing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Language use at home (Ref.: German)									
Other	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)
	0	44.5 (2.2)	91.0 (2.6)	0	36.4 (2.2)	87.6 (3.5)	n/a	n/a	n/a
Missing	0.2	0.4	39.0	0.5	0.6	38.8	n/a	n/a	n/a
Contact to Germans (min: 1 = daily; max: 6 = never)									
Mean (S.E.)	n/a	n/a	3.3 (0.1)	n/a	n/a	3.5 (0.1)	3.6 (0.0)	3.6 (0.0)	3.6 (0.0)
SD (S.E.)	n/a	n/a	1.9 (0.0)	n/a	n/a	1.9 (0.0)	1.8 (0.0)	1.8 (0.0)	1.8 (0.0)
Missing in %	n/a	n/a	2.4	n/a	n/a	1.6	1.0	1.0	1.0
Religiosity (min: 1 = not at all; max: 4 = very much)									
Mean (S.E.)	n/a	n/a	2.9 (0.1)	n/a	n/a	2.9 (0.1)	2.7 (0.0)	2.7 (0.0)	2.7 (0.0)
SD (S.E.)	n/a	n/a	0.9 (0.0)	n/a	n/a	0.9 (0.0)	0.7 (0.0)	0.7 (0.0)	0.7 (0.0)
Missing in %	n/a	n/a	53.9	n/a	n/a	55.6	9.1	9.1	9.1
Daycare attendance in country of origin (Ref.: No):									
Yes	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Missing	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Attendance of religious gatherings (0 = never - 3 = once a week)									
Mean (S.E.)	0.6 (0.0)	0.7 (0.0)	0.9 (0.0)	0.6 (0.0)	0.7 (0.0)	0.7 (0.0)	n/a	n/a	n/a
SD (S.E.)	0.8 (0.0)	1.0 (0.0)	1.2 (0.0)	0.9 (0.0)	1.0 (0.0)	1.1 (0.0)	n/a	n/a	n/a
Missing in %	0.3	0.7	3.3	0.2	1.6	2.3	n/a	n/a	n/a
Refugee specific									
Return orientation (Ref.: No)									
Yes	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)
	n/a	13.4 (1.7)	3.7 (0.7)	n/a	10.3 (1.5)	3.8 (0.7)	14.5 (0.8)	14.5 (0.8)	14.5 (0.8)
Missing	n/a	7.1	5.1	n/a	6.0	4.5	2.9	2.9	2.9
Legal status (Ref.: Secure status)									
Insecure status	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)
	n/a	n/a	37.2 (1.9)	n/a	n/a	35.2 (1.9)	10.0 (0.7)	10.0 (0.7)	10.0 (0.7)
Missing	n/a	n/a	3.9	n/a	n/a	1.6	26.8	26.8	26.8

Table A1 continued

Table A1 continued

Accommodation (Ref.: Private)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)	% (S.E.)
Collective	n/a	n/a	35.0 (1.5)	n/a	n/a	30.3 (1.5)	15.2 (0.0)
Missing	n/a	n/a	0.0	n/a	n/a	0.0	0.0
PTSD risk							
Min / max.	n/a	n/a	n/a	n/a	n/a	n/a	-0.5/5.7
Mean (S.E.)	n/a	n/a	n/a	n/a	n/a	n/a	0.0 (0.0)
SD (S.E.)	n/a	n/a	n/a	n/a	n/a	n/a	0.8 (0.0)
Missing in %	n/a	n/a	n/a	n/a	n/a	n/a	7.6

Note. Descriptives are based on multiple imputed data (m = 100).

*No mother in household or not clearly identifiable. + case numbers for SOEP data are also based on imputed data.

Table A2a: Early daycare attendance, under-3-year-olds

Model	2a-1	2a-2	2a-3	2a-4	2a-5	2a-6
<i>Group (Ref.: Natives)</i>						
Migrant sample	-0.090* (0.041)	-0.081* (0.035)	-0.064+ (0.035)	-0.034 (0.037)	-0.022 (0.036)	-0.012 (0.033)
Refugee sample	-0.204** (0.035)	-0.137** (0.031)	-0.114** (0.031)	0.064 (0.060)	0.119* (0.060)	0.087 (0.055)
Controls						
Number of siblings		-0.039** (0.015)	-0.032* (0.015)	-0.018 (0.015)	-0.031* (0.015)	-0.002 (0.013)
Single-parent family		-0.197** (0.046)	-0.170** (0.044)	-0.112* (0.044)	-0.027 (0.048)	-0.046 (0.049)
Child's gender: Male (Ref.: Female)		0.003 (0.034)	0.015 (0.033)	0.011 (0.033)	0.013 (0.032)	0.026 (0.029)
Child's age (in months)		0.024** (0.001)	0.025** (0.001)	0.024** (0.001)	0.024** (0.001)	0.019** (0.002)
Structural factors						
District size (Ref.: >500,000 inhabitants)			-0.032 (0.075)	-0.024 (0.072)	-0.023 (0.070)	-0.030 (0.070)
>100.000-500.000 inhabitants			-0.068 (0.058)	-0.058 (0.057)	-0.074 (0.057)	-0.088 (0.054)
<100.000 inhabitants			-0.032 (0.089)	-0.024 (0.089)	-0.023 (0.092)	-0.030 (0.083)
<i>Federal state (Ref.: North Rhine-Westphalia)</i>						
Baden-Wuerttemberg			0.146* (0.064)	0.121+ (0.063)	0.115+ (0.061)	0.108+ (0.056)
Bavaria			0.139** (0.052)	0.119* (0.053)	0.116* (0.052)	0.072 (0.050)
Berlin			0.303** (0.089)	0.274** (0.089)	0.282** (0.092)	0.243** (0.083)

Table A2a continued

Table A2a continued

Brandenburg	0.261* (0.121)	0.302* (0.120)	0.342** (0.116)	0.292** (0.113)
Bremen	0.179 (0.151)	0.266* (0.126)	0.235* (0.114)	0.127 (0.096)
Hamburg	0.103 (0.124)	0.073 (0.120)	0.069 (0.113)	0.080 (0.100)
Hesse	0.160** (0.062)	0.149* (0.061)	0.130* (0.062)	0.126* (0.057)
Mecklenburg-Pomerania	0.201 (0.127)	0.229+ (0.128)	0.256* (0.130)	0.208+ (0.116)
Lower Saxony	0.156** (0.057)	0.152** (0.057)	0.166** (0.056)	0.157** (0.051)
Rhineland-Palatinate	0.059 (0.070)	0.054 (0.069)	0.054 (0.069)	-0.015 (0.078)
Saarland	-0.080 (0.139)	-0.047 (0.121)	-0.042 (0.127)	-0.015 (0.122)
Saxony	0.225* (0.113)	0.244* (0.115)	0.290* (0.114)	0.224* (0.102)
Saxony-Anhalt	0.237+ (0.131)	0.298* (0.128)	0.347** (0.124)	0.294* (0.119)
Schleswig-Holstein	0.228** (0.085)	0.226** (0.085)	0.209* (0.082)	0.177** (0.073)
Thuringia	0.146 (0.143)	0.148 (0.142)	0.213 (0.137)	0.204 (0.126)
Daycare attendance rate in district	0.004 (0.003)	0.003 (0.003)	0.002 (0.003)	0.002 (0.003)
Social origin				
Highest family status (HISEI)		0.002 (0.001)	0.000 (0.001)	-0.000 (0.001)
Control: Has not worked yet in Germany		-0.138** (0.049)	-0.125** (0.047)	-0.075+ (0.042)

Table A2a continued

Table A2a continued

Highest parental education (Ref.: ISCED 0-1: Max. primary)					
ISCED 2: Secondary I	-0.103 (0.087)	-0.080 (0.083)			-0.028 (0.069)
ISCED 3-4: Secondary II + post-secondary	-0.074 (0.083)	-0.075 (0.078)			-0.033 (0.065)
ISCED 5-8: Any tertiary	-0.009 (0.086)	-0.039 (0.082)			0.008 (0.071)
Family income (<i>monthly</i>)		0.076** (0.020)			0.043* (0.020)
Working mother (Ref.: Mother does not work)					0.318** (0.043)
Control: No information on mother					0.123* (0.060)
Constant	0.347** (0.031)	-0.034 (0.036)	-0.267* (0.117)	-0.299* (0.148)	-0.439** (0.149)
					-0.400** (0.137)

Data: SOEP, n = 2,108; multiple imputed data (m=100).

Notes. + p < 0.1 * p < 0.05 ** p < 0.01; additional controls for child born in Germany; unstandardized linear regression coefficients; robust standard errors in parentheses; weighted.

Table A2b: Daycare attendance, 3-to-6-year-olds

Model	2b-1	2b-2	2b-3	2b-4	2b-5	2b-6
<i>Group (Ref.: Natives)</i>						
Migrant sample	-0.038* (0.015)	-0.034* (0.015)	-0.037* (0.015)	-0.031+ (0.016)	-0.027+ (0.016)	-0.025+ (0.015)
Refugee sample	-0.182** (0.023)	-0.180** (0.024)	-0.175** (0.024)	-0.108* (0.045)	-0.093* (0.046)	-0.098* (0.046)
Controls						
Number of siblings		-0.010 (0.008)	-0.014+ (0.008)	-0.010 (0.008)	-0.013 (0.009)	-0.008 (0.009)
Single-parent family		0.004 (0.015)	-0.000 (0.016)	0.018 (0.015)	0.041* (0.019)	0.033+ (0.019)
Child's gender: Male (Ref.: Female)		0.009 (0.013)	0.007 (0.013)	0.005 (0.013)	0.006 (0.013)	0.007 (0.013)
Child's age (in months)		0.002** (0.001)	0.002** (0.001)	0.002** (0.001)	0.002** (0.001)	0.002** (0.001)
Structural factors						
<i>District size (Ref.: >500,000 inhabitants)</i>						
>100.000-500.000 inhabitants			-0.061* (0.030)	-0.068* (0.030)	-0.066* (0.030)	-0.065* (0.030)
<100.000 inhabitants			-0.039** (0.013)	-0.043** (0.015)	-0.044** (0.015)	-0.046** (0.015)
<i>Federal state (Ref.: North Rhine-Westphalia)</i>						
Baden-Wuerttemberg			0.072** (0.025)	0.063* (0.025)	0.061* (0.025)	0.061* (0.025)
Bavaria			0.022 (0.027)	0.017 (0.027)	0.020 (0.027)	0.022 (0.027)
Berlin			-0.015 (0.024)	-0.025 (0.025)	-0.023 (0.025)	-0.027 (0.026)
Brandenburg			0.038	0.042	0.049+	0.050+

Table A2b continued

Table A2b continued

Bremen	(0.028)	(0.029)	(0.030)	(0.030)
	0.036	0.045	0.039	0.031
Hamburg	(0.038)	(0.044)	(0.044)	(0.044)
	0.015	0.004	0.000	-0.003
Hesse	(0.027)	(0.027)	(0.028)	(0.028)
	-0.002	-0.007	-0.006	-0.005
Mecklenburg-Pomerania	(0.039)	(0.039)	(0.040)	(0.039)
	0.073**	0.073*	0.087**	0.086**
Lower Saxony	(0.027)	(0.029)	(0.032)	(0.032)
	0.059**	0.056*	0.063**	0.065**
Rhineland-Palatinate	(0.022)	(0.022)	(0.023)	(0.024)
	0.043	0.044	0.040	0.039
Saarland	(0.043)	(0.045)	(0.045)	(0.045)
	0.061*	0.057+	0.068*	0.071*
Saxony	(0.027)	(0.031)	(0.030)	(0.030)
	0.053*	0.044*	0.052*	0.056*
Saxony-Anhalt	(0.023)	(0.022)	(0.023)	(0.023)
	0.049+	0.044+	0.049+	0.052+
Schleswig-Holstein	(0.026)	(0.026)	(0.026)	(0.027)
	0.033	0.024	0.024	0.022
Thuringia	(0.028)	(0.028)	(0.028)	(0.028)
	-0.017	-0.019	-0.012	-0.011
Daycare attendance quota in district	(0.068)	(0.068)	(0.067)	(0.066)
	-0.002	-0.002	-0.003	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)

Table A2b continued

Table A2b continued

Social origin					
Highest family status (HISEI)					
Control: Has not worked yet in Germany	0.000 (0.000)	-0.000 (0.001)	-0.000 (0.001)		
	-0.051 (0.034)	-0.049 (0.034)			
<i>Highest parental education (Ref.: ISCED 0-1: Max. primary)</i>					
ISCED 2: Secondary I	0.061 (0.072)	0.066 (0.071)			0.069 (0.071)
ISCED 3-4: Secondary II + postsecondary	0.059 (0.071)	0.057 (0.070)			0.060 (0.070)
ISCED 5-8: Any tertiary	0.073 (0.071)	0.065 (0.070)			0.070 (0.069)
Family income (<i>monthly</i>)		0.019* (0.008)			0.016+ (0.008)
Working mother (<i>Ref.: Mother does not work</i>)					0.038+ (0.020)
Control: No information on mother					0.022 (0.029)
Constant	0.979** (0.007)	0.879** (0.034)	1.088** (0.196)	1.018** (0.217)	1.010** (0.217)

Data: SOEP, n = 2,039; multiple imputed data (n=100).

Notes. + p < 0.1 * p < 0.05 ** p < 0.01; unstandardized linear regression coefficients; robust standard errors in parentheses; weighted.

Table A3a: Early daycare attendance of migrants and refugees, under-3-year-olds

Model	3a-1	3a-2	3a-3	3a-4	3a-5	3a-6	3a-7	3a-8
<i>Group (Ref.: Migrants)</i>								
Refugee sample	-0.113** (0.033)	-0.061* (0.030)	-0.046 (0.029)	0.091 (0.065)	0.117+ (0.061)	0.092 (0.059)	0.078 (0.060)	0.074 (0.059)
Controls								
Number of siblings		-0.035* (0.016)	-0.031+ (0.017)	-0.016 (0.018)	-0.030 (0.019)	-0.008 (0.017)	-0.007 (0.017)	-0.011 (0.017)
Single-parent family		-0.214** (0.066)	-0.182** (0.066)	-0.151** (0.057)	-0.083 (0.059)	-0.088 (0.059)	-0.089 (0.061)	-0.073 (0.062)
Child's gender: Male (Ref.: Female)		-0.025 (0.046)	-0.028 (0.046)	-0.039 (0.043)	-0.040 (0.043)	-0.011 (0.039)	-0.015 (0.039)	-0.016 (0.038)
Child's age (in months)		0.023** (0.002)	0.023** (0.002)	0.023** (0.002)	0.022** (0.002)	0.019** (0.002)	0.019** (0.002)	0.019** (0.002)
Structural factors								
<i>District size (Ref.: >500,000 inhabitants)</i>								
>100.000-500.000 inhabitants			-0.087 (0.094)	-0.065 (0.084)	-0.074 (0.081)	-0.061 (0.075)	-0.064 (0.073)	-0.068 (0.071)
<100.000 inhabitants			-0.128+ (0.071)	-0.117+ (0.067)	-0.135* (0.067)	-0.117+ (0.063)	-0.128* (0.062)	-0.129* (0.061)
<i>Federal state (Ref.: North Rhine-Westphalia)</i>								
Baden-Wuerttemberg			0.154* (0.075)	0.092 (0.068)	0.080 (0.066)	0.078 (0.065)	0.071 (0.062)	0.071 (0.063)
Bavaria			0.025 (0.057)	-0.013 (0.055)	-0.022 (0.054)	-0.053 (0.051)	-0.062 (0.052)	-0.066 (0.052)
Berlin			0.058 (0.111)	0.023 (0.112)	0.030 (0.115)	0.036 (0.120)	0.029 (0.117)	0.028 (0.113)
Brandenburg			0.286+ (0.165)	0.241 (0.158)	0.277+ (0.157)	0.120 (0.152)	0.117 (0.151)	0.137 (0.150)
Bremen			0.091 (0.158)	0.164 (0.139)	0.130 (0.126)	0.073 (0.106)	0.057 (0.111)	0.029 (0.114)

Table A3a continued

Table A3a continued

Hamburg	-0.021 (0.167)	-0.077 (0.155)	-0.078 (0.146)	-0.077 (0.126)	-0.098 (0.126)	-0.083 (0.126)
Hesse	0.053 (0.088)	0.010 (0.083)	0.007 (0.081)	0.003 (0.073)	0.007 (0.072)	0.002 (0.072)
Mecklenburg-Pommern	-0.164 (0.170)	-0.264 (0.164)	-0.288+ (0.164)	-0.278+ (0.152)	-0.250 (0.152)	-0.286+ (0.154)
Lower Saxony	0.046 (0.074)	0.044 (0.072)	0.045 (0.074)	0.041 (0.072)	0.045 (0.072)	0.024 (0.074)
Rhineland-Palatinate	0.092 (0.069)	0.080 (0.065)	0.078 (0.063)	0.030 (0.068)	0.020 (0.070)	0.026 (0.071)
Saarland	0.451* (0.193)	0.369* (0.184)	0.408* (0.199)	0.431+ (0.235)	0.423+ (0.226)	0.383+ (0.213)
Saxony	0.100 (0.171)	0.070 (0.150)	0.095 (0.153)	0.034 (0.126)	0.030 (0.126)	0.031 (0.127)
Saxony-Anhalt	-0.108 (0.178)	0.070 (0.185)	0.107 (0.182)	0.002 (0.166)	-0.002 (0.166)	0.007 (0.163)
Schleswig-Holstein	0.178 (0.119)	0.155 (0.115)	0.105 (0.109)	0.104 (0.096)	0.104 (0.100)	0.102 (0.100)
Thuringia	-0.113 (0.202)	-0.046 (0.191)	0.043 (0.193)	-0.048 (0.177)	-0.063 (0.176)	-0.061 (0.173)
Daycare attendance quota in district	0.004 (0.005)	0.003 (0.004)	0.002 (0.004)	0.005 (0.004)	0.004 (0.004)	0.004 (0.004)

Social origin

Highest family status (HISEI)

0.003+
(0.002)0.001
(0.002)0.001
(0.001)

Control: Has not worked yet in Germany

-0.055
(0.071)-0.043
(0.063)-0.035
(0.058)

Highest parental education (Ref.: ISCED 0-1: Max. primary)

ISCED 2: Secondary I

-0.123
(0.089)-0.108
(0.084)-0.051
(0.075)

Table A3a continued

Table A3a continued

ISCED 3-4: Secondary II + postsecondary	-0.110 (0.088)	-0.108 (0.084)	-0.072 (0.074)	-0.061 (0.074)	-0.068 (0.076)
ISCED 5-8: Any tertiary	-0.015 (0.090)	-0.032 (0.089)	0.012 (0.079)	0.021 (0.078)	0.007 (0.081)
Family income (<i>monthly</i>)		0.065** (0.023)	0.037 (0.023)	0.038+ (0.023)	0.044+ (0.024)
Working mother (<i>Ref.: Mother does not work</i>)			0.262** (0.058)	0.262** (0.057)	0.255** (0.056)
Control: No information on mother			0.091 (0.062)	0.090 (0.062)	0.092 (0.063)
Migrant-specific					
Mother's German language proficiency				-0.012 (0.026)	-0.009 (0.026)
Father/partner's German language proficiency				-0.038 (0.028)	-0.040 (0.028)
Parent is 1.Gen migrant					0.081+ (0.048)
wControl: Parent born in Germany					-0.002 (0.072)
Other language use at home (<i>Ref.: German</i>)					-0.067 (0.042)
Attendance of religious gatherings					-0.005 (0.018)
Constant	0.257** (0.028)	-0.076 (0.049)	-0.170 (0.157)	-0.215 (0.183)	-0.334* (0.168)
				-0.353* (0.168)	-0.326+ (0.173)

Data: SOEP, n = 1,536; multiple imputed data (m=100).

Notes. + p < 0.1 * p < 0.05 ** p < 0.01; unstandardized linear regression coefficients; robust standard errors in parentheses; weighted.

Table A3b: Daycare attendance of migrants and refugees, 3-to-6-year-olds

Model	3b-1	3b-2	3b-3	3b-4	3b-5	3b-6	3b-7	3b-8
<i>Group (Ref.: Migrants)</i>								
Refugee sample	-0.144** (0.026)	-0.148** (0.028)	-0.134** (0.029)	-0.071 (0.052)	-0.057 (0.053)	-0.063 (0.051)	-0.057 (0.053)	-0.034 (0.054)
Controls								
Number of siblings		-0.018 (0.014)	-0.023+ (0.014)	-0.015 (0.013)	-0.021 (0.014)	-0.015 (0.014)	-0.015 (0.014)	-0.017 (0.014)
Single-parent family		0.004 (0.033)	-0.008 (0.035)	0.024 (0.032)	0.052 (0.035)	0.034 (0.034)	0.034 (0.034)	0.029 (0.036)
Child's gender: Male (<i>Ref.: Female</i>)		0.029 (0.025)	0.020 (0.025)	0.019 (0.025)	0.025 (0.026)	0.029 (0.026)	0.025 (0.025)	0.015 (0.025)
Child's age (<i>in months</i>)		0.004** (0.001)	0.004** (0.001)	0.004** (0.001)	0.004** (0.001)	0.004** (0.001)	0.004** (0.001)	0.004** (0.001)
Structural factors								
<i>District size (Ref.: >500,000 inhabitants)</i>								
>100.000-500.000 inhabitants			-0.090 (0.056)	-0.100+ (0.054)	-0.092+ (0.054)	-0.097+ (0.053)	-0.093+ (0.051)	-0.090+ (0.051)
<100.000 inhabitants			-0.055* (0.023)	-0.063* (0.027)	-0.063* (0.027)	-0.068* (0.027)	-0.070* (0.028)	-0.071* (0.029)
<i>Federal state (Ref.: North Rhine-Westphalia)</i>								
Baden-Wuerttemberg			0.100* (0.041)	0.081+ (0.043)	0.078+ (0.043)	0.069 (0.043)	0.068+ (0.041)	0.081* (0.041)
Bavaria			0.058 (0.039)	0.041 (0.041)	0.049 (0.042)	0.043 (0.041)	0.044 (0.041)	0.053 (0.043)
Berlin			-0.039 (0.053)	-0.064 (0.059)	-0.056 (0.057)	-0.075 (0.057)	-0.076 (0.060)	-0.078 (0.061)
Brandenburg			0.058 (0.086)	0.043 (0.084)	0.038 (0.080)	0.030 (0.079)	0.023 (0.077)	0.009 (0.076)

Table A3b continued

Table A3b continued

Bremen	0.049 (0.051)	0.052 (0.058)	0.041 (0.058)	0.021 (0.059)	0.007 (0.060)	-0.039 (0.063)
Hamburg	0.053 (0.034)	0.024 (0.039)	0.023 (0.039)	0.002 (0.045)	0.018 (0.048)	0.029 (0.046)
Hesse	-0.029 (0.080)	-0.044 (0.082)	-0.043 (0.083)	-0.047 (0.081)	-0.044 (0.083)	-0.048 (0.079)
Mecklenburg-Pomerania	0.124** (0.042)	0.096* (0.043)	0.120* (0.047)	0.087+ (0.052)	0.094+ (0.052)	0.121+ (0.068)
Lower Saxony	0.092* (0.038)	0.091* (0.039)	0.094* (0.039)	0.084* (0.039)	0.093* (0.041)	0.094* (0.039)
Rhineland-Palatinate	0.075 (0.059)	0.075 (0.064)	0.068 (0.062)	0.057 (0.063)	0.058 (0.061)	0.068 (0.064)
Saarland	0.131** (0.043)	0.134** (0.050)	0.146** (0.050)	0.146** (0.047)	0.142** (0.045)	0.141** (0.052)
Saxony	0.083* (0.040)	0.055 (0.046)	0.069 (0.048)	0.069 (0.047)	0.072 (0.049)	0.092 (0.057)
Saxony-Anhalt	0.002 (0.099)	0.003 (0.100)	0.007 (0.103)	0.005 (0.106)	0.007 (0.103)	0.011 (0.107)
Schleswig-Holstein	0.044 (0.050)	0.019 (0.054)	0.017 (0.052)	0.007 (0.054)	0.017 (0.058)	0.018 (0.056)
Thuringia	-0.089 (0.229)	-0.083 (0.222)	-0.047 (0.223)	-0.062 (0.211)	-0.045 (0.211)	-0.055 (0.190)
Daycare attendance quota in district	-0.001 (0.004)	-0.001 (0.004)	-0.002 (0.004)	-0.002 (0.004)	-0.003 (0.004)	-0.004 (0.005)
Social origin						
Highest family status (HISEI)		0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.001 (0.001)
Control: Has not worked yet in Germany		-0.052 (0.050)	-0.051 (0.049)	-0.020 (0.055)	-0.026 (0.055)	-0.033 (0.054)

Table A3b continued

Table A3b continued

Highest parental education (Ref.: ISCED 0-1: Max. primary)

ISCED 2: Secondary I	0.030 (0.071)	0.033 (0.070)	0.037 (0.071)	0.040 (0.071)	0.023 (0.069)
ISCED 3-4: Secondary II + postsecondary	0.037 (0.070)	0.037 (0.068)	0.039 (0.068)	0.037 (0.068)	0.024 (0.065)
ISCED 5-8: Any tertiary	0.059 (0.067)	0.049 (0.064)	0.054 (0.065)	0.053 (0.064)	0.043 (0.061)
Family income (<i>monthly</i>)		0.026+ (0.015)	0.022 (0.015)	0.027+ (0.015)	0.023 (0.016)
Working mother (<i>Ref.: Mother does not work</i>)			0.071* (0.034)	0.065* (0.033)	0.067* (0.032)
Control: No information on mother			0.010 (0.046)	0.013 (0.046)	0.006 (0.044)
Migrant-specific					
Mother's German language proficiency				0.015 (0.020)	0.020 (0.019)
Father/partner's German language proficiency				-0.029 (0.020)	-0.017 (0.018)
Parent is 1.Gen migrant					0.029 (0.047)
Control: Parent born in Germany					0.061 (0.039)
Other language use at home (<i>Ref.: German</i>)					-0.056 (0.035)
Attendance of religious gatherings					-0.020 (0.018)
Constant	0.942** (0.014)	0.755** (0.072)	0.865* (0.370)	0.819* (0.369)	0.824* (0.369)
				0.862* (0.369)	0.847* (0.382)
					1.045* (0.420)

Data: SOEP, n = 1,398; multiple imputed data (m=100).

Notes. + p < 0.1 * p < 0.05 ** p < 0.01; unstandardized linear regression coefficients; robust standard errors in parentheses; weighted.

Table A4a: Early daycare attendance of refugees, under-3-year-olds

Model	4a-1	4a-2	4a-3	4a-4	4a-5	4a-6	4a-7	4a-8
<i>Origin (Ref.: Syria)</i>								
Afghanistan	0.135 (0.169)	0.147 (0.152)	0.083 (0.153)	0.105 (0.146)	0.102 (0.147)	0.124 (0.150)	0.095 (0.146)	0.069 (0.147)
Iraq	0.338* (0.171)	0.326* (0.163)	0.294+ (0.164)	0.306+ (0.163)	0.309+ (0.162)	0.332* (0.165)	0.309+ (0.169)	0.310+ (0.170)
Other	-0.045 (0.066)	0.112 (0.071)	0.071 (0.067)	0.065 (0.065)	0.064 (0.065)	0.078 (0.064)	-0.001 (0.135)	-0.013 (0.139)
Controls								
Number of siblings	-0.021+ (0.011)	-0.025* (0.011)	-0.025* (0.011)	-0.021+ (0.011)	-0.017 (0.013)	-0.018 (0.013)	-0.015 (0.013)	-0.017 (0.013)
Single-parent family	0.024 (0.064)	0.024 (0.064)	0.049 (0.059)	0.076 (0.059)	0.066 (0.060)	0.032 (0.060)	0.020 (0.062)	0.006 (0.062)
Child's gender: Male (Ref.: Female)	0.042 (0.032)	0.042 (0.032)	0.055+ (0.030)	0.056+ (0.030)	0.056+ (0.030)	0.050+ (0.029)	0.051+ (0.029)	0.052+ (0.028)
Child's age (in months)	0.011** (0.002)	0.011** (0.002)	0.012** (0.002)	0.012** (0.002)	0.012** (0.002)	0.012** (0.002)	0.012** (0.002)	0.012** (0.002)
Structural factors								
<i>District size (Ref.: >500,000 inhabitants)</i>								
>100.000-500.000 inhabitants			-0.087 (0.062)	-0.086 (0.061)	-0.085 (0.061)	-0.072 (0.060)	-0.070 (0.061)	-0.059 (0.061)
<100.000 inhabitants			0.012 (0.063)	0.005 (0.062)	0.006 (0.063)	0.009 (0.062)	0.008 (0.064)	0.012 (0.064)
<i>Federal state (Ref.: North Rhine-Westphalia)</i>								
Baden-Wuerttemberg			0.018 (0.066)	0.020 (0.064)	0.019 (0.064)	-0.001 (0.063)	0.007 (0.065)	-0.016 (0.063)
Bavaria			-0.024 (0.057)	-0.014 (0.056)	-0.016 (0.056)	-0.014 (0.056)	-0.012 (0.055)	-0.026 (0.056)
Berlin			0.170+ (0.170)	0.167 (0.167)	0.161 (0.161)	0.123 (0.123)	0.116 (0.116)	0.095 (0.095)

Table A4a continued

Table A4a continued

Brandenburg	(0.103)	(0.106)	(0.108)	(0.105)	(0.105)	(0.114)
	0.155	0.136	0.132	0.139	0.160	0.181
Bremen	(0.117)	(0.119)	(0.119)	(0.117)	(0.120)	(0.123)
	0.362*	0.379*	0.386*	0.383*	0.370*	0.355*
Hamburg	(0.164)	(0.160)	(0.161)	(0.152)	(0.157)	(0.140)
	0.214	0.206	0.208	0.215	0.225	0.229
Hesse	(0.145)	(0.147)	(0.145)	(0.139)	(0.139)	(0.140)
	-0.081+	-0.067	-0.065	-0.072	-0.063	-0.064
Mecklenburg-Pommern	(0.048)	(0.047)	(0.047)	(0.047)	(0.046)	(0.048)
	-0.081	-0.072	-0.072	-0.087	0.025	0.111
Lower Saxony	(0.135)	(0.129)	(0.129)	(0.118)	(0.122)	(0.133)
	-0.043	-0.040	-0.040	-0.025	-0.022	-0.019
Rhineland-Palatinate	(0.043)	(0.043)	(0.043)	(0.043)	(0.044)	(0.043)
	0.043	0.034	0.039	0.038	0.039	0.039
Saarland	(0.066)	(0.065)	(0.065)	(0.067)	(0.069)	(0.069)
	-0.098	-0.136	-0.126	-0.065	-0.051	-0.074
Saxony	(0.135)	(0.139)	(0.136)	(0.137)	(0.136)	(0.144)
	0.009	0.006	0.006	-0.004	0.003	0.034
Saxony-Anhalt	(0.093)	(0.091)	(0.091)	(0.090)	(0.089)	(0.093)
	-0.090	-0.098	-0.104	-0.116	-0.102	-0.060
Schleswig-Holstein	(0.092)	(0.090)	(0.092)	(0.089)	(0.090)	(0.094)
	0.020	0.030	0.036	0.047	0.037	0.047
Thuringia	(0.074)	(0.076)	(0.076)	(0.076)	(0.079)	(0.077)
	0.260	0.237	0.237	0.115	0.129	0.156
Daycare attendance rate in district	(0.195)	(0.179)	(0.180)	(0.123)	(0.124)	(0.127)
	-0.000	0.000	0.001	0.000	-0.000	-0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)

Table A4a continued

Table A4a continued

Social origin					
Highest family status (HISEI)	0.001 (0.003)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)
Control: Has not worked yet in Germany	-0.003 (0.098)	-0.007 (0.098)	0.029 (0.094)	0.027 (0.094)	0.040 (0.090)
<i>Highest parental education (Ref.: ISCED 0-1: Max. primary)</i>					
ISCED 2: Secondary I	0.048 (0.042)	0.049 (0.042)	0.038 (0.042)	0.034 (0.044)	0.021 (0.043)
ISCED 3-4: Secondary II + postsecondary	0.052 (0.043)	0.054 (0.043)	0.041 (0.043)	0.036 (0.045)	0.018 (0.044)
ISCED 5-8: Any tertiary	0.102* (0.046)	0.104* (0.046)	0.091* (0.046)	0.079 (0.051)	0.051 (0.054)
Family income (<i>monthly</i>)		-0.021 (0.031)	-0.014 (0.030)	-0.018 (0.031)	-0.012 (0.032)
Working mother (<i>Ref.: Mother does not work</i>)			0.547** (0.107)	0.532** (0.108)	0.537** (0.109)
Control: No information on mother			-0.081** (0.029)	-0.096** (0.032)	-0.099** (0.032)
Migrant-specific					
Mother's German language proficiency				0.020 (0.024)	0.020 (0.024)
Father/partner's German language proficiency				-0.002 (0.022)	-0.002 (0.021)
Contact to Germans				0.015+ (0.008)	0.013+ (0.008)
Child born in Germany				0.254+ (0.149)	0.270+ (0.153)
Years since migration				0.146 (0.092)	0.150 (0.091)

Table A4a continued

Table A4b: Daycare attendance of refugees, 3-to-6-year-olds

Model	4b-1	4b-2	4b-3	4b-4	4b-5	4b-6	4b-7	4b-8
<i>Origin (Ref.: Syria)</i>								
Afghanistan	0.096* (0.046)	0.099* (0.045)	0.095* (0.044)	0.088+ (0.047)	0.087+ (0.047)	0.082+ (0.047)	0.080+ (0.048)	0.095+ (0.053)
Iraq	0.015 (0.058)	0.010 (0.058)	0.020 (0.052)	0.031 (0.053)	0.029 (0.054)	0.037 (0.054)	0.051 (0.053)	0.063 (0.053)
Other	0.016 (0.062)	0.002 (0.058)	0.059 (0.049)	0.039 (0.049)	0.035 (0.049)	0.023 (0.049)	0.021 (0.050)	0.047 (0.059)
Controls								
Number of siblings	-0.017 (0.017)	-0.017 (0.017)	-0.012 (0.015)	-0.009 (0.015)	-0.007 (0.017)	-0.003 (0.017)	-0.003 (0.017)	-0.005 (0.017)
Single-parent family	0.047 (0.076)	0.047 (0.076)	0.022 (0.071)	0.034 (0.070)	0.030 (0.073)	0.002 (0.076)	-0.015 (0.072)	-0.015 (0.072)
Child's gender: Male (Ref: Female)	-0.032 (0.039)	-0.032 (0.039)	-0.039 (0.037)	-0.039 (0.036)	-0.038 (0.036)	-0.035 (0.035)	-0.028 (0.034)	-0.031 (0.034)
Child's age (in months)	0.009** (0.002)	0.009** (0.002)	0.009** (0.002)	0.009** (0.002)	0.009** (0.002)	0.009** (0.002)	0.008** (0.002)	0.008** (0.002)
Structural factors								
<i>District size (Ref.: >500,000 inhabitants)</i>								
>100.000-500.000 inhabitants			0.057 (0.080)	0.066 (0.081)	0.066 (0.081)	0.053 (0.080)	0.016 (0.080)	0.027 (0.079)
<100.000 inhabitants			0.046 (0.079)	0.051 (0.080)	0.050 (0.080)	0.038 (0.079)	0.002 (0.078)	0.013 (0.078)
<i>Federal state (Ref.: North Rhine-Westphalia)</i>								
Baden-Wuerttemberg			0.128* (0.064)	0.136* (0.062)	0.136* (0.062)	0.130* (0.061)	0.131* (0.061)	0.129* (0.060)
Bavaria			0.035 (0.075)	0.033 (0.071)	0.033 (0.071)	0.016 (0.070)	0.055 (0.069)	0.053 (0.070)
Berlin			-0.232 (0.176)	-0.205 (0.169)	-0.210 (0.168)	-0.262 (0.165)	-0.272+ (0.158)	-0.253 (0.163)

Table A4b continued

Table A4b continued

Brandenburg	0.076 (0.076)	0.074 (0.077)	0.074 (0.077)	0.065 (0.074)	0.050 (0.078)	0.052 (0.075)
Bremen	0.228 (0.194)	0.216 (0.186)	0.218 (0.188)	0.242 (0.178)	0.088 (0.177)	0.077 (0.172)
Hamburg	0.282* (0.119)	0.299* (0.122)	0.300* (0.122)	0.295* (0.131)	0.236+ (0.123)	0.259* (0.126)
Hesse	0.066 (0.066)	0.079 (0.066)	0.079 (0.066)	0.059 (0.067)	0.086 (0.065)	0.090 (0.067)
Mecklenburg-Pommernia	0.104 (0.097)	0.047 (0.099)	0.050 (0.100)	0.059 (0.087)	0.021 (0.119)	0.034 (0.132)
Lower Saxony	0.191** (0.068)	0.210** (0.068)	0.210** (0.068)	0.216** (0.069)	0.196** (0.068)	0.191** (0.066)
Rhineland-Palatinate	0.067 (0.080)	0.083 (0.080)	0.084 (0.080)	0.094 (0.083)	0.109 (0.084)	0.095 (0.083)
Saarland	0.227** (0.070)	0.197* (0.085)	0.199* (0.086)	0.243** (0.091)	0.174+ (0.090)	0.190* (0.085)
Saxony	-0.063 (0.094)	-0.029 (0.095)	-0.029 (0.095)	-0.023 (0.100)	-0.053 (0.097)	-0.063 (0.098)
Saxony-Anhalt	-0.119 (0.122)	-0.094 (0.118)	-0.093 (0.119)	-0.117 (0.113)	-0.125 (0.104)	-0.131 (0.106)
Schleswig-Holstein	0.093 (0.097)	0.101 (0.095)	0.102 (0.094)	0.082 (0.093)	0.040 (0.093)	0.047 (0.090)
Thuringia	-0.021 (0.089)	0.004 (0.088)	0.004 (0.088)	0.002 (0.091)	0.004 (0.088)	-0.003 (0.096)
Daycare attendance rate in district	0.024** (0.007)	0.023** (0.007)	0.023** (0.007)	0.022** (0.007)	0.019** (0.007)	0.019** (0.007)

Table A4b continued

Table A4b continued

Social origin					
Highest family status (HISEI)	0.002 (0.003)	0.002 (0.003)	0.002 (0.002)	0.001 (0.003)	0.001 (0.002)
Control: Has not worked yet in Germany	-0.041 (0.101)	-0.042 (0.101)	-0.026 (0.098)	-0.052 (0.098)	-0.037 (0.097)
<i>Highest parental education (Ref.: ISCED 0-1; Max. primary)</i>					
ISCED 2: Secondary I	-0.042 (0.052)	-0.041 (0.052)	-0.042 (0.052)	-0.051 (0.052)	-0.053 (0.052)
ISCED 3-4: Secondary II + postsecondary	0.068 (0.050)	0.068 (0.050)	0.058 (0.048)	0.015 (0.049)	0.013 (0.049)
ISCED 5-8: Any tertiary	-0.017 (0.056)	-0.016 (0.056)	-0.014 (0.054)	-0.050 (0.057)	-0.055 (0.057)
Family income (<i>monthly</i>)		-0.009 (0.039)	-0.009 (0.038)	-0.011 (0.036)	-0.008 (0.037)
Working mother (<i>Ref.: Mother does not work</i>)			0.124 (0.105)	0.024 (0.104)	0.032 (0.102)
Control: No information on mother			-0.102* (0.044)	-0.116** (0.043)	-0.119** (0.042)
Migrant-specific					
Mother's German language proficiency				0.039 (0.026)	0.033 (0.026)
Father/partner's German language proficiency				0.040 (0.026)	0.038 (0.026)
Years since migration				0.074** (0.020)	0.071** (0.020)
Other language use at home (<i>Ref.: German</i>)				-0.080 (0.074)	-0.078 (0.074)
Attendance of religious gatherings				0.005 (0.015)	0.001 (0.015)

Table A4b continued

Table A4 continued

Refugee-specific	
Return orientation (<i>Ref.: No</i>)	0.133 (0.083)
Contact to Germans	0.009 (0.011)
Accommodation: Collective (<i>Ref.: Private</i>)	0.011 (0.046)
Legal status: Insecure (<i>Ref.: Secure</i>)	-0.019 (0.049)
Constant	0.775** (0.029) 0.316* (0.122) -1.954** (0.640) -1.850** (0.637) -1.832** (0.634) -1.756** (0.640) -1.375* (0.615) -1.415* (0.622)

Data: SOEP, n = 932; multiple imputed data (m=100).

Notes. + p < 0.1 * p < 0.05 ** p < 0.01; unstandardized linear regression coefficients; robust standard errors in parentheses; weighted.

Table A5: Daycare attendance of refugees SOEP-ReGES

Data	SOEP (3-6)										ReGES							
	5-S1	5-S2	5-S3	5-S4	5-S5	5-S6	5-S7	5-R1	5-R2	5-R3	5-R4	5-R4a	5-R5	5-R6	5-R6a	5-R7	5-R7a	5-R8
Model																		
Country of Origin (Ref.: Syria)																		
Afghanistan	0.096* (0.046)	0.099* (0.045)	0.095* (0.044)	0.091+ (0.047)	0.088+ (0.047)	0.087+ (0.051)	0.112* (0.056)	-0.065* (0.027)	-0.064* (0.026)	-0.050+ (0.027)	-0.042 (0.027)	-0.037 (0.027)	-0.042 (0.027)	-0.028 (0.026)	-0.027 (0.026)	-0.03 (0.027)	-0.031 (0.027)	-0.027 (0.026)
Iraq	0.015 (0.058)	0.010 (0.058)	0.020 (0.052)	0.027 (0.053)	0.033 (0.052)	0.043 (0.052)	0.060 (0.052)	-0.024 (0.029)	-0.025 (0.029)	-0.057+ (0.031)	-0.042 (0.031)	-0.04 (0.031)	-0.042 (0.031)	-0.053+ (0.031)	-0.051 (0.031)	-0.056+ (0.032)	-0.066* (0.032)	-0.062+ (0.032)
Other	0.016 (0.062)	0.002 (0.058)	0.059 (0.049)	0.046 (0.049)	0.030 (0.049)	0.051 (0.050)	0.080 (0.059)	0.025 (0.040)	0.022 (0.040)	0.007 (0.039)	0.007 (0.039)	0.001 (0.039)	0.008 (0.039)	-0.014 (0.040)	-0.017 (0.040)	-0.018 (0.041)	-0.019 (0.041)	-0.026 (0.041)
Controls																		
Number of siblings	-0.017 (0.017)	-0.012 (0.015)	-0.009 (0.015)	-0.004 (0.015)	-0.004 (0.015)	-0.006 (0.015)	-0.006 (0.015)	-0.008 (0.005)	-0.010+ (0.006)	-0.007 (0.005)	-0.007 (0.005)	-0.006 (0.005)	-0.007 (0.005)	-0.006 (0.005)	-0.006 (0.005)	-0.006 (0.005)	-0.006 (0.005)	-0.005 (0.005)
Single parent	0.047 (0.076)	0.022 (0.071)	0.022 (0.071)	0.022 (0.071)	-0.010 (0.073)	-0.014 (0.068)	-0.007 (0.068)	-0.024 (0.016)	-0.024 (0.016)	-0.024 (0.016)	-0.025 (0.016)	-0.023 (0.016)	-0.025 (0.016)	-0.022 (0.016)	-0.023 (0.016)	-0.022 (0.016)	-0.023 (0.016)	-0.023 (0.016)
Child's gender: male (Ref.: female)	-0.032 (0.039)	-0.039 (0.037)	-0.031 (0.036)	-0.029 (0.036)	-0.029 (0.036)	-0.030 (0.034)	-0.030 (0.034)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)
Child's age (in months)	0.009** (0.002)	0.009** (0.002)	0.009** (0.002)	0.009** (0.002)	0.009** (0.002)	0.008** (0.002)	0.008** (0.002)	-0.064* (0.026)	-0.050+ (0.027)	-0.042 (0.027)	-0.042 (0.027)	-0.037 (0.027)	-0.042 (0.027)	-0.028 (0.026)	-0.027 (0.026)	-0.03 (0.027)	-0.031 (0.027)	-0.027 (0.026)
Structural factors																		
District size (Ref.: >500,000 inhabitants)																		
>100,000-500,000 inhabitants		0.057 (0.080)	0.064 (0.081)	0.054 (0.080)	0.054 (0.080)	0.026 (0.079)	0.034 (0.079)											
<100,000 inhabitants		0.046 (0.079)	0.049 (0.079)	0.038 (0.078)	0.038 (0.078)	0.009 (0.078)	0.018 (0.077)											
Federal state (Ref.: NRW)																		
Baden-Wuerttemberg		0.128* (0.064)	0.139* (0.062)	0.133* (0.061)	0.125* (0.061)	0.128* (0.060)	0.128* (0.060)											

Table A5 continued

Table A5 continued

[illegible]

Table A5 continued

Social origin											
<i>Highest parental education (Ref.: ISCED 0-1; Max. primary)</i>											
ISCED 2: Secondary I	-0.040 (0.052)	-0.040 (0.052)	-0.045 (0.052)	-0.046 (0.052)	0.036 (0.029)	0.031 (0.029)	0.036 (0.029)	0.021 (0.029)	0.02 (0.029)	0.022 (0.029)	0.018 (0.029)
ISCED 3-4: Secondary II + postsecondary	0.080 (0.049)	0.070 (0.048)	0.021 (0.049)	0.023 (0.050)	0.03 (0.026)	0.019 (0.026)	0.03 (0.026)	0.008 (0.026)	0.007 (0.026)	0.008 (0.026)	-0.002 (0.027)
ISCED 5-8: Any tertiary	-0.009 (0.064)	-0.002 (0.063)	-0.053 (0.065)	-0.059 (0.065)	0.053+ (0.031)	0.035 (0.031)	0.053+ (0.031)	0.022 (0.031)	0.022 (0.031)	0.022 (0.031)	0.009 (0.031)
Highest family status in home country	0.000 (0.002)	-0.000 (0.002)	-0.000 (0.002)	0.000 (0.002)	0.001* (0.001)	0.001 (0.001)	0.001* (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
HISEI control: did not work in home country	0.118** (0.040)	0.097* (0.041)	0.039 (0.043)	0.043 (0.043)	0.042* (0.021)	0.043* (0.021)	0.042* (0.021)	0.034 (0.021)	0.035+ (0.021)	0.033 (0.021)	0.034+ (0.021)
Books at home in country of origin					0.026** (0.007)						0.019** (0.007)
<i>Working mother (Ref.: Mother does not work)</i>		0.189+ (0.101)	0.076 (0.097)	0.077 (0.094)	-0.004 (0.056)	-0.008 (0.056)	-0.011 (0.056)	-0.008 (0.056)	-0.011 (0.056)	-0.016 (0.056)	
Control: No information on mother		-0.087+ (0.047)	-0.112* (0.045)	-0.117** (0.045)							
Migrant-specific											
Mother's German language proficiency			0.037 (0.027)	0.036 (0.026)	0.023* (0.010)	0.023* (0.010)	0.023* (0.010)	0.023* (0.010)	0.024* (0.010)	0.023* (0.010)	
Father/partner's German language proficiency			0.040 (0.027)	0.040 (0.027)	0.046** (0.011)	0.046** (0.011)	0.047** (0.011)	0.047** (0.011)	0.047** (0.011)	0.045** (0.011)	

Table A5 continued

Table A5 continued

Years since migration	0.069** (0.020)	0.067** (0.020)	0.068** (0.011)	0.069** (0.011)	0.068** (0.011)	0.067** (0.011)
Contact to Germans	0.013 (0.011)	0.012 (0.011)	0.006 (0.005)	0.006 (0.005)	0.006 (0.005)	0.006 (0.005)
Religiosity	-0.024 (0.029)	-0.025 (0.029)	-0.005 (0.012)	-0.005 (0.012)	-0.004 (0.013)	-0.006 (0.013)
Daycare attendance in home country			0.042+ (0.023)	0.023* (0.010)	0.024* (0.010)	0.038+ (0.023)
Refugee specific						
Legal status: insecure (Ref.: Secure)	0.138 (0.087)			-0.009 (0.031)	-0.01 (0.031)	-0.009 (0.031)
Accommodation: collective (Ref.: Private)	0.017 (0.046)			0.011 (0.036)	0.006 (0.036)	0.006 (0.035)
Return orientation: Yes (Ref.: No)	-0.023 (0.049)			-0.023 (0.024)	-0.025 (0.024)	-0.024 (0.024)
PTSD risk				0.024* (0.010)	0.023* (0.010)	0.023* (0.010)
Constant	0.775** (0.029)	0.316* (0.122)	-1.95** (0.640)	-1.90** (0.632)	-1.84** (0.625)	-1.40* (0.606)
		-1.50* (0.614)	-0.311 (0.276)	-0.311 (0.276)	-0.311 (0.276)	-0.241 (0.278)
			-0.255 (0.277)	-0.253 (0.279)	-0.253 (0.279)	-0.208 (0.280)
			0.837** (0.009)	0.858** (0.081)	0.837** (0.009)	0.837** (0.009)

Data: SOEP, n = 2,005; ReGES, n = 2,183; multiple imputed data (m=100).

Notes. + p < 0.1 * p < 0.05 ** p < 0.01; unstandardized linear regression coefficients, robust standard errors in parentheses; SOEP results weighted.

Stefan Schipolowski, Aileen Edele, Nicole Mahler & Petra Stanat

Mathematics and science proficiency of young refugees in secondary schools in Germany

Abstract

Reliable information on the integration of refugee students in the German educational system is scarce. In this paper, we examine refugee students' proficiency in mathematics, biology, chemistry, and physics in comparison to other students with and without an immigrant background, including non-refugee foreign-born students. We analyzed test data from 44,882 ninth-grade students, including 939 refugees, who participated in a national educational monitoring study in Germany (IQB Trends in Student Achievement 2018). In a series of regression models, we estimated the extent to which differences in students' language proficiency and their families' social background account for disparities in mathematics and science achievement. Compared to students without an immigrant background, refugee students' achievement scores were on average 15 to 17 points lower (on a scale with SD = 10 for all ninth-grade students in Germany). Refugees also scored substantially lower than non-refugee foreign-born students (difference of 7 to 10 points). Taking social background and language proficiency into account substantially reduced refugees' achievement disadvantage to 2 to 5 points compared to students without an immigrant background and to 1 to 5 points compared to non-refugee foreign-born students, with language proficiency explaining the largest proportion of variance. The remaining disparities correspond to a learning gain of roughly one school year in Germany. The results emphasize the importance of providing effective support aimed at fostering refugees' proficiency in the language of instruction.

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Keywords

Mathematics; Science; Achievement; Large-scale assessment; Refugee students

Mathematische und naturwissenschaftliche Kompetenzen von Jugendlichen mit Fluchtbiografie am Ende der Sekundarstufe I

Zusammenfassung

Bisher liegen kaum belastbare Informationen zur Integration junger Geflüchteter im deutschen Schulsystem vor. In diesem Beitrag untersuchen wir die Kompetenzen geflüchteter Jugendlicher in den Fächern Mathematik, Biologie, Chemie und Physik im Vergleich zu anderen Heranwachsenden mit und ohne Zuwanderungshintergrund, einschließlich Jugendlichen der ersten Zuwanderergeneration ohne Fluchtbiografie. Analysiert wurden Testdaten von 44.882 Neuntklässlerinnen und Neuntklässlern, darunter 939 Geflüchtete, die an einer Studie zum nationalen Bildungsmonitoring (IQB-Bildungstrend 2018) teilgenommen haben. Mit Regressionsanalysen prüften wir, inwieweit Disparitäten in den Kompetenzen auf Unterschiede in den Sprachkenntnissen und im sozialen Hintergrund der Familien zurückgeführt werden können. Verglichen mit Jugendlichen ohne Zuwanderungshintergrund erzielten geflüchtete Jugendliche im Durchschnitt um 15 bis 17 Punkte niedrigere Kompetenzwerte (auf einer Skala mit $SD = 10$ für alle Neuntklässlerinnen und Neuntklässler in Deutschland). Auch die Differenz zu Jugendlichen der ersten Zuwanderergeneration ohne Fluchtbiografie war mit 7 bis 10 Punkten substanziell. Unter Berücksichtigung der Sprachkenntnisse und des sozialen Hintergrunds fielen die Disparitäten mit 2 bis 5 Punkten im Vergleich zu Heranwachsenden ohne Zuwanderungshintergrund bzw. 1 bis 5 Punkten im Vergleich zu Jugendlichen der ersten Zuwanderergeneration ohne Fluchtbiografie erheblich geringer aus, wobei Sprachkenntnisse die größte Varianzaufklärung leisteten. Die verbleibenden Unterschiede in den mathematisch-naturwissenschaftlichen Kompetenzen entsprechen dem Lernzuwachs, der in deutschen Schulen ungefähr in einem Schuljahr erreicht wird. Die Ergebnisse unterstreichen die Bedeutung effektiver Sprachförderung für geflüchtete Kinder und Jugendliche.

Schlagworte

Mathematik; Naturwissenschaften; Kompetenzen; Large-scale assessment; Geflüchtete

1. Introduction

The global population of forcibly displaced people remains at a record high (UNHCR, 2019a). Within the last few years, a large number of refugees arrived in Germany, many of them at school age. They come from various origin countries, with particularly large shares from Syria, Afghanistan and Iraq (BAMF, 2018). For their future perspectives as well as for German society overall, it is crucial to ensure that these students succeed in the German educational system. At the same time, integrating the newly arrived children and adolescents is challenging for the school system, for schools, and for teachers.

Despite the relevance of the issue, we currently know surprisingly little about how successful the German school system is in supporting the newly arrived refugee children and adolescents and about the determinants of their successful integration (see El-Mafaalani & Massumi, 2019). The present study examines the competencies students have attained in core school subjects toward the end of secondary school and compares them to those of other students with and without an immigrant background, including first-generation immigrant students who are not refugees. We analyzed mathematics and science proficiencies of recently arrived refugee students in grade 9, when students can potentially obtain the first regular school-leaving certificate. At this point in the educational pathway, competencies are not only key indicators of educational success, but also pivotal for students' future paths towards the labor market or tertiary education. We further estimate to what degree achievement gaps can be attributed to differences in cultural and economic resources of students' families and proficiency in German as the language of instruction – two factors that are known to have substantial explanatory power for achievement disadvantages of students with an immigrant background (see section 1.2).

1.1 Mathematics and science proficiencies as indicators of educational success

To participate in knowledge-based and increasingly technological modern societies, competencies in mathematics and the natural sciences are indispensable (e.g., Cromley, 2009). Moreover, occupations in fields related to mathematics and the sciences open good professional prospects, as an increasing number of jobs requires profound knowledge in these domains. Developing students' mathematics and science proficiencies hence are core educational objectives (e.g., Bybee & Fuchs, 2006). In Germany, *The Standing Conference of the Ministers of Education and Cultural Affairs* (KMK) has defined *National Educational Standards* for several subjects, including mathematics and the natural sciences (e.g., KMK, 2004), which constitute mandatory learning targets for almost all students in Germany.

Mathematical and science-related contents are less specific to the cultural context and school system than contents of other school subjects, such as history or language arts. Hence, the achievement disadvantages of refugee students in mathematics and the sciences can be expected to be less pronounced than in other school subjects. Yet, the special learning conditions of refugees (see section 1.2) are likely to result in lower levels of mathematics and science proficiency compared to students who have attended the German school system from the start and also compared to non-refugee foreign-born students.

1.2 Learning conditions of recently arrived refugee students

Previous research indicates that in most countries, including Germany, students of immigrant descent often struggle to attain similar achievement levels as non-immigrants. Across domains, the achievement gaps are typically most pronounced for first-generation immigrant students and smaller for second-generation students (Henschel et al., 2019; OECD, 2016a; Weis et al., 2019). Research consistently shows that student achievement, including mathematics and science proficiency, is strongly associated with students' family background (e.g., OECD, 2016a, 2019; Mahler & Kölm, 2019). Highly educated parents with prestigious jobs, high income and strong social networks typically have more economic, cultural, and social resources available to support the educational success of their children (e.g., Feinstein, Duckworth, & Sabates, 2008). Moreover, proficiency in the language of instruction is crucial for acquiring new competencies in school (Kempert et al., 2016; Prevoo et al., 2016; Stanat & Edele, 2016), including knowledge and skills in mathematics and the natural sciences (e.g., Härtig, Heitmann, & Retelsdorf, 2015). The pivotal role of language in science learning is reflected in the strong relationship between reading proficiency and science achievement (e.g., Cromley, 2009). It is therefore not surprising that the on average lower cultural and economic capital of immigrant families and the language spoken in students' families explain a large proportion of the achievement disadvantages of students with an immigrant background (Henschel et al., 2019; OECD, 2016a, 2016b, 2019; Weis et al., 2019). When analyses consider these factors, the achievement gaps are often completely leveled out or even reversed for second-generation students and considerably reduced to about a third of their initial size for first-generation students (e.g., Weis et al., 2019).

Recently arrived refugee students share many characteristics and acculturation conditions with other immigrants, particularly other foreign-born students who were not forcibly displaced (Cerna, 2019). However, in several respects, the learning conditions of newly arrived refugee students are special. Refugee students' preconditions for learning certainly are far from uniform as, for instance, the educational systems in their origin countries and their personal experiences vary greatly, resulting in differential educational outcomes of different ethnic groups (Wong & Schweitzer, 2017). Despite this variation, scholars widely agree that refugees need

to overcome more obstacles to adjust to and succeed in school (Berry, 1987; Cerna, 2019; Crul et al., 2019; Graham, Minhas, & Paxton, 2016; McBrien, 2005).

The learning experiences of refugee students can be divided into the phases before, during and after their migration (Dryden-Peterson, 2016; Ryan, Dooley, & Benson, 2008). Prior to migration, refugees often experienced traumatic situations, which can hinder their learning (McBrien, 2005; Fazel, Reed, Panter-Brick, & Stein, 2012; Wong & Schweitzer, 2019). Due to war, conflict, violence, or persecution, many school-aged refugees were unable to attend school regularly in their origin countries and often had to interrupt their education (Cerna, 2019; Dryden-Peterson, 2016), resulting in special challenges for refugees' school integration (e.g., Birman & Tran, 2017). In addition, the school systems refugee students previously attended are often less effective than the German system. For instance, in the *Trends in International Mathematics and Science Study* (TIMSS) of 2011, Syrian 8th-graders reached relatively low scores in mathematics achievement (Mullis, Martin, Foy, & Arora, 2012), even though the Syrian education system before the war was often considered more effective than the systems of many other origin countries of refugees.

During the often-prolonged migration phase, which may include several transitional residencies, school-aged refugees often attend provisional schools or no schools at all (UNHCR, 2019b). The school systems in the transition countries are often overburdened with the inclusion of large number of refugee students. For instance, in Turkey, a common transition country of Syrian refugees to Germany, many refugee children did not attend regular schools (Cerna, 2019; Crul et al., 2019). Those refugees who attend regular schools often encounter language barriers (Crul et al., 2019), impeding their competence development.

At least equally important for the adjustment of young refugees are the circumstances in the post-migration phase (Fazel et al., 2012; Porter & Haslam, 2005). In most European countries, it takes several months after arrival until refugee children enter the school system (Koehler & Schneider, 2019), with an average delay of about 6 months in Germany (Henschel et al., 2019; Will et al., 2018). Due to these interruptions and limitations in schooling before, during and after migration, refugees are likely to enter the German school system with lower proficiency levels than students who attended the German system from the start.

Moreover, the socioeconomic and cultural resources of refugee families are often limited. Refugees typically come from developing countries and their average educational attainment is lower than in Germany, also in comparison to other migrants (Romiti et al., 2016; Liebau & Salikutluk, 2016; Spörlein, Kristen, Schmidt, & Welker, 2020). In addition, the cultural resources of refugees, such as language skills and education, are not easily transferable to the new context and they often have lost their social resources. Moreover, their financial resources are often limited, and it takes time until they enter the job market in the new country of residence (Salikutluk et al., 2016). Hence, refugee families generally have limited resources at hand to support the learning process of their children. Due to the migration-related changes in their socioeconomic status and the limited trans-

ferability of their resources, the relationship between family background and refugee students' educational success may be somewhat weaker than in other students' groups. Yet, the socioeconomic family background should nevertheless be relevant for their educational success in Germany. In line with this reasoning, analyses based on data from the *IAB-BAMF-SOEP Survey of Refugees*, a representative longitudinal study of refugee households, indicate that higher parental education increases the likelihood of refugee students to attend the intermediate or academic track rather than the vocational track in the German school system (de Paivo Lareiro, 2019).

Moreover, most refugee students do not speak the language of instruction when they arrive in their new country of residence. To overcome the language barrier, the primary objective for refugees after entering school in Germany is to learn German. A considerable proportion of refugee students therefore initially attends separate classes (see section 1.3) that focus on language acquisition and put less emphasis on acquiring knowledge in other domains. Refugees attending regular classes from the start probably initially struggle to follow teacher instruction and further develop their competencies in subject domains. Initial language deficits are therefore likely to translate into accumulating knowledge gaps in subject domains, including mathematics and the sciences. This reasoning is in line with previous research suggesting that proficiency in the language of instruction is an important predictor of immigrant students' educational success (Wong & Schweitzer, 2017). Taken together, in order to succeed in the education system of the new country of residence, refugee children have to overcome several obstacles associated with lower initial competence levels due to limitations in prior schooling, limited resources of parents to support their children, and language barriers.

1.3 The educational integration of recently arrived refugee students in Germany

Data on the educational integration and achievement of refugees is generally very limited, as most studies on school achievement do not identify refugees (Cerna, 2019). Until recently, this also applied to educational research in Germany (e.g., El-Mafaalani & Massumi, 2019). Currently available are mainly findings on refugees' school participation. According to data of the *IAB-BAMF-SOEP Survey of Refugees*, the vast majority of children (> 94%) who had arrived in Germany between 01/2013 and 02/2016 attended school in the first half of 2016.¹ About one third of the students (31%) attended a preparatory class for recently arrived immigrants rather than a regular class in 2016 (Gambaro, Liebau, Peter, & Weinhardt, 2017).

¹ The remaining 6% include students with missing information and students who did not attend school.

The data further show that refugees are overrepresented at lower school tracks of Germany's tracked secondary school system. A representative study of ninth-grade students in Germany, the *IQB Trends in Student Achievement 2018*-study (Stanat, Schipolowski, Mahler, Weirich, & Henschel, 2019), indicates that 34% of refugee students attended the lowest track (*Hauptschule*), compared to 11 percent of the general student population and 25 percent of first-generation immigrant students without refugee background. In contrast, only 8 percent of refugees attended the academic school track (*Gymnasium*) compared to 35 percent of the general population and 23 percent of the non-refugee first generation (Henschel et al., 2019). Analyses based on the *IAB-BAMF-SOEP Survey of Refugees* and data from the *Refugees in the German Educational System* (ReGES)-study, a longitudinal study examining a preschool and an adolescent cohort of refugees and their families in five German Federal States (Will et al., 2018), revealed similar patterns. Thus, the vast majority of recently arrived refugee students has access to the German school system; however, they are considerably overrepresented at lower school tracks.

At the same time, the recently arrived refugees have high educational aspirations. According to the ReGES-study, the majority of adolescents (72%) would ideally like to attain a school degree that allows them to study at a university. The proportion of adolescents who realistically expect to attain this degree is also very high (66%). And the aspirations of their parents are even more ambitious: 83 percent ideally wish that their children obtain a university entrance degree and 80 percent realistically expect them to do so (Will et al., 2018). These expectations are in line with the high educational aspirations of immigrants in general (e.g., Salikutluk, 2016), but in stark contrast with the school tracks they actually attend.

We currently know very little about refugee students' school-related proficiencies. The *IAB-BAMF-SOEP Survey of Refugees* included a short test assessing adolescents' knowledge in science and technology (Schipolowski & Edele, 2019), employing multilingual item presentation (i.e., in students' heritage languages and in German). On average, refugees achieved lower scores than students who had attended the German school system from the start; the mean difference was roughly equivalent to what is gained in learning during one school year in Germany. At the same time, refugees' test scores showed greater variability, suggesting that they differ considerably in their prior knowledge when they enter the German school system (Schipolowski, Edele, Pagel, & Liebau, 2019).

Taken together, it is to date largely unknown which competence levels refugee students have reached in core school subjects a few years after they entered the German school system and how they perform compared to other students with and without an immigrant background. Similarly, we know very little about the factors that could explain achievement differences and about the degree to which their role is similar for refugee students and for other students with an immigrant background.

1.4 The present study

The present study examines mathematics and science achievement of recently arrived ninth-grade refugee students in Germany. In a first step, we investigate disparities in educational achievement between refugees and students without an immigrant background (research question 1a) and compare them to the disparities found for other students with an immigrant background. We then focus on differences in achievement scores between refugees and other foreign-born students whose families were not forced to migrate (research question 1b). This comparison is particularly relevant as it provides information on the extent to which the school achievement of refugee students is specific or resembles the school achievement of other first-generation immigrant students. We expect that refugee students attain substantially lower levels of mathematics and science proficiency than students without an immigrant background and second-generation immigrants who attended the German school system from the start and typically entered it with at least basic German language skills. Given the special learning conditions and obstacles that refugees face (see section 1.2) and that they immigrated very recently, we assume that they also show lower levels of mathematics and science proficiency than non-refugee foreign-born students.

Our study further determines to what degree differences in the sociocultural family background, in students' proficiency in the language of instruction, and in the amount of schooling received in Germany and other countries account for the expected achievement disadvantages of recently arrived refugee students (research question 2). These analyses inform us whether achievement relates in a similar (or different) fashion to key learning conditions in refugees as in non-refugee migrants. We expect that, as in other students with an immigrant background, the on average lower levels of cultural and economic resources and their often limited proficiency in the language of instruction account for a considerable proportion of refugees' achievement disadvantages. Yet, given the often interrupted and limited schooling of refugee students in combination with other challenges they face, including those associated with the limited transferability of the cultural and economic resources of their families, we do not assume that these factors fully account for refugees' achievement gaps in comparison to other students, including other first-generation immigrant students.

2. Method

2.1 Study design and procedure

The data were collected between April and June 2018 in the *IQB Trends in Student Achievement 2018*-study (for an English description of the study and its results see Stanat, Schipolowski, Mahler, Weirich, & Henschel, 2020), a nation-wide

large-scale educational assessment that constitutes a central part of the national educational monitoring in Germany. The study included achievement tests for mathematics, biology, chemistry, and physics based on the *National Educational Standards* in secondary education. Standardized achievement tests and questionnaires were administered to students from a randomly drawn sample of schools based on a complex rotation design (*balanced incomplete block design*; Becker, Weirich, Mahler, & Sachse, 2019). Each student completed one of 96 different booklets containing mathematics tasks, science tasks, or both. Refugee students received regular booklets without adaptations in terms of item difficulty or language. Students also completed a questionnaire and a language test. Participation in the achievement tests was mandatory for the selected schools (except for some private schools) and students whereas completion of the student questionnaire was voluntary and required parental consent in some states. Students' parents were also asked to fill out a questionnaire on a voluntary basis.

2.2 Participants

2.2.1 Total sample and relevant subsamples

Analyses are based on a total sample of $N = 44,882$ ninth-graders from 2,253 classes in 1,462 schools. Using case weights, the sample is representative of the population of ninth-grade students in Germany across school types and tracks in all of the 16 states. Mean age of the students in the unweighted sample was 15.6 years ($SD = 0.65$) and 48.2 percent of the participants were female.

About 26.5 percent ($n = 11,889$) of the students had an immigrant background (i.e., at least one foreign-born parent), including refugees. Second generation immigrant students (i.e., both parents foreign-born, student born in Germany) made up 10.8 percent of the sample ($n = 4,869$) and 5.9 percent were first generation immigrant students (i.e., student and both parents foreign-born or refugees based on the study definition, see 2.2.1). The first generation includes non-refugee students (3.8%, $n = 1,712$) and refugee students (2.1%, $n = 939$). The immigrant status of 5,250 students (11.7%) in the total sample could not be classified as the relevant information was not available, neither from the student or parent questionnaires nor from school officials.

Due to the booklet design, not all students were administered both mathematics and science tasks. Therefore, the following analyses are based on two overlapping subsamples of students with mathematics achievement data ($n = 25,342$) or science achievement data ($n = 25,506$). Using specific case weights for these two subsamples, both are representative of the target population.

2.2.2 Identification of refugees

The study definition of refugees included all ninth-graders who had arrived in Germany as refugees in the year 2014 or later. Identification of refugees was based on information by school officials which was available for 97.9 percent of the students. If this information was unavailable, we used questionnaire data on the country of birth and the time of immigration into Germany. In both cases, we did not consider students as refugees if they were born in the European Union or in a country which signed the Schengen Agreement. General exclusion criteria (see Stanat et al., 2019, 2020) were applied to refugees and non-refugees alike. Most noteworthy, students were only included in the study if they had attended a German school for at least one year.²

Based on these criteria, 939 students were identified as refugees. Among those with valid information on their birth country ($n = 762$), the by far largest proportion of refugees in the sample was born in Syria (47.1%), followed by adolescents from Afghanistan (18.8%), Iraq (9.1%), and Iran (4.6%). For all other countries, percentages were below 2 percent. Note that birth countries were quite different for refugees than for non-refugee foreign-born students, with the latter most often indicating Poland (14.7%), the Russian Federation (10.2%), and Romania (5.3%) followed by Syria, Turkey, Bulgaria, and Kazakhstan (about 4% each) and a large number of other countries (each below 3%).

2.3 Measures

2.3.1 Achievement tests

Achievement in mathematics, biology, chemistry, and physics was assessed with items developed by teams of teachers and experts in mathematics and science education based on the *National Educational Standards* in secondary education (for item examples, see Stanat et al., 2019). Mathematics items covered all five proficiency domains described in the educational standards: *Numbers*, *measurements*, *space and shape*, *functional relations*, and *data and chance*. In biology, chemistry, and physics, analyses for the present article focus on the domain *subject knowledge*. For all four subjects, a wide variety of items was employed, including items with closed and open response formats. The number of test items for each subject is given in Table 1.

² This criterion led to the exclusion of about 8 percent of the ninth-graders identified as refugees in the schools.

2.3.2 Language test

A C-test was used as an indicator of students' proficiency in German. C-tests are a variant of the cloze principle (Klein-Braley, 1997): In a short coherent text, every second half of every second word is missing; participants have to fill in the gaps in a meaningful and linguistically correct manner. C-tests are widely used as indicators of general language proficiency (e.g., Eckes, 2017). In the study at hand, two different texts were used with 30 gaps each. Note that the test was designed as an L1 test and exhibited a floor effect for refugees (i.e., 77% of the refugees solved 5 or less out of 30 items correctly), yet the variability of scores for this group was large (see below).

2.3.3 Sociodemographic information

The student and parent questionnaires contained questions about the socioeconomic and cultural background of the family, including the number of books at home as an established indicator of cultural capital (Jerrim & Micklewright, 2014) and the occupations of the parents. Foreign-born students and their parents were also asked to indicate the number of books at their (former) home in their origin country. This information was used for refugees in the analyses, if available, otherwise we used the information given for Germany. Information on parents' occupations³ was used to derive the *International Socio-Economic Index of Occupational Status* (ISEI; Ganzeboom, 2010) which reflects the average education level and income associated with the respective occupation. The highest ISEI value of the students' parents (HISEI) was subsequently used as an indicator of socioeconomic status (Mahler & Kölm, 2019).

The questionnaires further assessed parents' and students' countries of birth and how long the students had visited a school in Germany and schools outside of Germany, respectively. Foreign-born students were further asked to indicate since when they lived in Germany. Information from the student and parent questionnaires were combined in order to reduce the amount of missing data on the respective variables.

2.4 Data preparation and statistical analyses

Data preparation and parameter estimation closely followed the procedures described by Becker et al. (2019). Accordingly, for all variables used in subsequent analyses, missing values were replaced using multiple imputation. The percentages of missings that had to be imputed are provided in Table 1. Person parameters

3 If one or both parents were currently unemployed, they were asked to provide information about their last occupation.

(i.e., proficiency scores) for the students in mathematics were derived from a constrained two-parameter logistic (2PL) model with all mathematics items loading on the same dimension whereas scores for the sciences are based on a multidimensional Rasch (1PL) model. However, contrary to the usual practice in educational monitoring studies, in the present study missing values on the test items were ignored for parameter estimation because language barriers can lead to an increase in missing values which, in turn, is likely to produce biased proficiency estimates if missing responses are treated as incorrect (Köhler, Pohl, & Carstensen, 2017). For each student and subject 15 *plausible values* (PVs) were drawn and subsequently standardized to $M = 100$ and $SD = 10$ in the total population of all ninth-graders. This is a different reporting metric than the metric used by Stanat et al. (2019) as the scores are not directly comparable.

Language proficiency scores are based on a unidimensional Rasch model applied to the C-test data to derive *Weighted Likelihood Estimates* (WLEs).

Correlations, means, standard deviations, and regression coefficients were calculated with the Mplus 8.3 software based on the 15 PVs for each subject and all 15 imputed data sets. Case weights were used in all analyses. The complex structure of the sample (i.e., students nested in schools) was taken into account in the estimation of standard errors which also reflect differences in the reliability of the measures in each of the subpopulations (e.g., for refugees).

3. Results

To provide an overview of the bivariate relationships between the variables in the (sub)populations that are subsequently analyzed using regression models, Table 1 shows correlation estimates between test scores, cultural capital, and SES variables in the total population and the in subpopulation of foreign-born students (including refugees). For the latter, we also included the variables pertaining to how long students have already lived in Germany and how long they attended schools in Germany and abroad. Additional correlational analyses distinguishing between refugees and non-refugee foreign-born students are available in the appendix (see Table A-1).

For both the total population and foreign-born students, achievement scores in the four subjects were highly correlated, with the strongest correlations among the science subjects. Mathematics and science proficiency were also strongly associated with language proficiency in the total population and in the group of foreign-born students, with similar correlations for all four subjects. The relationships between achievement scores and indicators of socioeconomic status and cultural capital were also substantial, yet somewhat lower for foreign-born students.

In the subpopulation of foreign-born students, the analyses indicate that students who resided longer in Germany and students who attended a school in Germany for a longer period of time showed better test results. There are notewor-

thy mean differences on these variables between refugees and other foreign-born students: On average, the refugee sample had resided in Germany for about 2.9 years at the time of testing, had attended a German school for 2.4 years and schools outside of Germany for 6.2 years. By contrast, non-refugee foreign-born students reported having lived in Germany for 8.2 years, had visited a school in Germany for 6.0 years and schools in other countries for 3.4 years on average. Note that these are rough approximations as the information was missing for a considerable proportion of cases (see Table 1).

Table 1: Correlations between the variables used in analyses for the total population and in the subpopulation of refugees and other foreign-born students

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Mathematics achievement	.93	.66	.70	.76	.61	.29	.35	.26	.27	-.17
2. Biology achievement	.72	.87	.82	.82	.62	.23	.33	.31	.30	-.18
3. Chemistry achievement	.74	.89	.87	.84	.60	.22	.31	.35	.36	-.24
4. Physics achievement	.79	.89	.90	.89	.63	.24	.33	.36	.35	-.18
5. Language (C-test)	.68	.70	.68	.70	.93	.21	.37	.42	.44	-.32
6. Socioecon. status (HISEI)	.40	.36	.35	.37	.37	–	.31	.11	.08	-.02
7. Cultural capital (books)	.45	.44	.43	.45	.45	.43	–	.18	.18	-.12
8. Duration of stay Germany ¹	–	–	–	–	–	–	–	–	.83	-.63
9. Time in school Germany ¹	–	–	–	–	–	–	–	–	–	-.67
10. Time in school abroad ¹	–	–	–	–	–	–	–	–	–	–
Number of items	415	59	64	67	60	–	–	–	–	–
% missing in total sample	0	33	33	36	2	16	11	11	28	12
% missing 1st generation ²	0	36	33	36	9	22	8	19	33	13
% missing refugees ³	0	36	34	36	18	37	20	34	44	27

Notes. Values below the diagonal are correlation coefficients for the total sample ($N = 44,882$), values above the diagonal are correlations in the subpopulation of refugees and other foreign-born students ($n = 2,651$). Values in the diagonal are reliability estimates (if applicable). Percentages of missing values for the achievement scores represent design-related missings in the subsamples of students receiving mathematics booklets and sciences booklets, respectively ($n_{\text{Mathematics}} = 25,342$, $n_{\text{Sciences}} = 25,506$). ¹ Foreign-born students only. ² including refugees. ³ $n = 939$. All correlation coefficients are statistically significant ($p < .05$), exceptions are grayed out.

3.1 Disparities in achievement scores in mathematics and the sciences

Group differences in mathematics and science achievement with and without statistically controlling for language proficiency and social background were estimated with a series of regression analyses for each of the four subjects. In a first step, we analyzed differences in achievement scores between refugees and students without an immigrant background, not taking into account any covariates (research question 1a; see model 1 in Table 2). For comparison purposes, we also estimated disparities in achievement for other students with an immigrant background.

Table 2: Regression models for mathematics and science achievement with immigrant background, social background, and language proficiency as predictors

	Model I		Model II		Model III		Model IV	
	<i>b</i>	(<i>SE</i>)	<i>b</i>	(<i>SE</i>)	<i>b</i>	(<i>SE</i>)	<i>b</i>	(<i>SE</i>)
Mathematics								
Without immigrant background	102.1	(.25)	101.1	(.18)	100.5	(.12)	100.2	(.11)
2nd generation	-4.4	(.35)	-1.1	(.32)	-0.9	(.25)	0.2	(.25)
1st generation non-refugees	-6.0	(.58)	-2.6	(.51)	-0.2	(.41)	0.9	(.41)
Refugees	-14.8	(.71)	-9.9	(.68)	-2.9	(.72)	-2.4	(.69)
Socioeconomic status (HISEI)			2.4	(.11)			1.3	(.09)
Cultural capital (books)			3.0	(.10)			1.4	(.08)
German language proficiency					6.5	(.10)	5.5	(.10)
<i>R</i> ²	.09	(.01)	.29	(.01)	.46	(.01)	.50	(.01)
Biology								
Without immigrant background	102.2	(.24)	101.1	(.18)	100.4	(.12)	100.2	(.11)
2nd generation	-4.3	(.37)	-1.0	(.32)	-0.6	(.25)	0.3	(.25)
1st generation non-refugees	-8.4	(.57)	-5.4	(.48)	-1.7	(.40)	-1.2	(.39)
Refugees	-14.9	(.62)	-10.2	(.66)	-2.4	(.65)	-1.9	(.66)
Socioeconomic status (HISEI)			2.0	(.11)			0.8	(.09)
Cultural capital (books)			3.1	(.12)			1.3	(.09)
German language proficiency					6.8	(.09)	6.0	(.09)
<i>R</i> ²	.10	(.01)	.27	(.01)	.50	(.01)	.53	(.01)
Chemistry								
Without immigrant background	102.2	(.25)	101.2	(.18)	100.5	(.13)	100.3	(.12)
2nd generation	-4.6	(.36)	-1.5	(.31)	-1.0	(.26)	-0.1	(.25)
1st generation non-refugees	-7.1	(.56)	-4.2	(.47)	-0.6	(.39)	-0.1	(.38)
Refugees	-14.7	(.66)	-10.2	(.69)	-2.6	(.71)	-2.2	(.71)
Socioeconomic status (HISEI)			1.9	(.11)			0.8	(.09)
Cultural capital (books)			3.1	(.12)			1.3	(.09)
German language proficiency					6.6	(.09)	5.8	(.09)
<i>R</i> ²	.10	(.01)	.26	(.01)	.47	(.01)	.50	(.01)
Physics								
Without immigrant background	102.2	(.25)	101.2	(.18)	100.6	(.12)	100.3	(.11)
2nd generation	-4.2	(.36)	-0.9	(.31)	-0.6	(.24)	0.4	(.24)
1st generation non-refugees	-7.5	(.55)	-4.4	(.49)	-0.9	(.40)	-0.4	(.40)
Refugees	-17.3	(.66)	-12.7	(.66)	-5.1	(.65)	-4.6	(.65)
Socioeconomic status (HISEI)			2.0	(.11)			0.9	(.09)
Cultural capital (books)			3.1	(.11)			1.3	(.09)
German language proficiency					6.7	(.10)	5.8	(.10)
<i>R</i> ²	.11	(.01)	.29	(.01)	.50	(.01)	.53	(.01)

Notes. Regression coefficients for 2nd generation, 1st generation non-refugees, and refugees represent differences in achievement scores on the reporting metric compared to students without an immigrant background. Continuous variables (HISEI, books, language proficiency) were z-standardized. All coefficients are statistically significant ($p < .05$), exceptions are grayed out. *b* = unstandardized regression coefficient, *SE* = standard error, *R*² = determination coefficient.

Unstandardized regression coefficients (b) in Table 2 represent the difference in the average test score for the respective subpopulation compared to students without an immigrant background on the reporting metric standardized to $M = 100$ and $SD = 10$ points in the total population of all ninth-graders. Corresponding group means and standard deviations can be found in the appendix (see Table A2).

The results were similar for the four subjects. Without control variables, disparities for refugees amounted to about 15 points in mathematics, biology as well as chemistry and 17 points in physics. In other words, proficiency scores were approximately 1.5 standard deviations lower for refugees than for students without an immigrant background. By comparison, disparities were also substantial but considerably smaller for non-refugee foreign-born students. The smallest disparities were found for second-generation immigrant students.

3.2 Estimation of group differences in achievement taking language proficiency and social background into account

To examine the extent to which disadvantages of refugees in mathematics and science achievement can be attributed to differences in social background and language proficiency (research question 2), we extended model 1 in several steps (see Table 2). In model 2, socioeconomic status and cultural capital were added to the regression. Model 3 estimates how group differences change when controlling for German language proficiency. Model 4, finally, shows the differences in achievement for the groups when taking both social background and language proficiency into account.

The results were again similar for the four subjects. Differences in the achievement scores of refugees as well as other immigrant students compared to students without an immigrant background were partially accounted for by group differences in socioeconomic status and cultural capital (model 2). Although the students with an immigrant background still had significantly lower scores, disparities for all subpopulations were substantially smaller after controlling for these background variables. However, the disparities for refugees still amounted to between 10 and 13 points. In comparison, disparities for non-refugee foreign-born students were reduced to about 3 to 5 points and the disparities for the second immigrant generation were almost negligible after including social background variables in the analyses (group difference of about 1 point).

The explanatory power of language proficiency for differences between students with and without an immigrant background in mathematics and science achievement was very substantial (model 3).⁴ Most importantly, controlling for individual differences in German language proficiency considerably reduced the achieve-

4 It could be argued that by coding spelling mistakes as incorrect answers, the language test did not adequately capture the relevant language skills of refugees, as correct spelling is not required to follow instructions or to complete the achievement tests. We therefore re-coded the language test for a random subsample of refugees and non-refugees without

ment gap for refugees to about 2 (biology) to 5 points (physics). Disparities for second-generation students and non-refugee foreign-born students were very small in this model and often not statistically significant when differences in language proficiency were taken into account.

Entering both the social background variables and the language test scores into the regressions (model 4) yielded similar results as model 3, showing that group differences were primarily associated with the general proficiency in the language of instruction. Notably, the differences in mathematics and science achievement between refugees and students without an immigrant background were small but still statistically significant.

3.3 Differences in mathematics and science achievement between refugees and non-refugee foreign-born students

We now turn to a direct comparison of mathematics and science achievement between refugees and other foreign-born ninth-graders (see Table 3). Limiting regression analyses to first generation immigrants also allows for including their duration of stay in Germany, time spent in schools in Germany, and time spent in schools in other countries, as these variables are only meaningful in this subpopulation.

As implied by the results described above (see 3.1), without control variables refugees' average test scores were significantly lower than the average test scores of other foreign-born students (research question 1b; group difference of about 7 to 10 points; see model 1 in Table 3).

In subsequent models, we again added covariates to determine their explanatory power for these achievement differences (research question 2). When the social background variables and the language test score were included in the analyses (model 2), differences in mathematics and science achievement between refugees and non-refugee foreign-born students were substantially reduced to about 2 (biology) to 5 points (physics), but they remained statistically significant in all subjects. To check whether the remaining differences between refugees and foreign-born non-refugees could be attributed to differences in the duration of their stay in Germany, the time spent in schools in Germany, or the time spent in schools abroad, we also added these variables to the regression (model 3). This did not change the overall pattern of results; with the exception of biology, the group differences were still significant and of similar magnitude as in model 2.⁵ Note that

taking spelling mistakes into account and repeated the regression analyses using these language test scores. The results were practically identical to the results reported here.

- 5 Surprising is the result for model 3 in mathematics: adding the last set of variables resulted in a larger difference in achievement between refugees and non-refugees compared to model 2. However, considering the large confidence intervals for the respective regression coefficients, the difference between the coefficients for refugees from models 2 and 3 is not significant.

Table 3: Regression models for the estimation of group differences in mathematics and science achievement between refugees and other foreign-born students (1st generation non-refugees)

	Model I		Model II		Model III	
	<i>b</i>	(<i>SE</i>)	<i>b</i>	(<i>SE</i>)	<i>b</i>	(<i>SE</i>)
Mathematics						
1st generation non-refugees	96.2	(.60)	100.8	(.48)	100.0	(.63)
Refugees	-8.8	(.85)	-3.8	(.83)	-4.7	(.93)
Socioeconomic status (HISEI)			1.7	(.33)	1.7	(.33)
Cultural capital (books)			1.0	(.38)	1.0	(.37)
German language proficiency			5.1	(.39)	5.3	(.41)
Duration of stay Germany					-0.2	(.35)
Time in school Germany					-0.3	(.35)
Time in school abroad					-0.0	(.22)
<i>R</i> ²	.15	(.03)	.45	(.03)	.45	(.03)
Biology						
1st generation non-refugees	93.7	(.58)	98.3	(.44)	98.6	(.61)
Refugees	-6.5	(.82)	-1.5	(.87)	-1.2	(1.0)
Socioeconomic status (HISEI)			0.8	(.35)	0.7	(.35)
Cultural capital (books)			0.9	(.34)	1.0	(.34)
German language proficiency			5.3	(.42)	5.3	(.42)
Duration of stay Germany					0.4	(.33)
Time in school Germany					-0.0	(.37)
Time in school abroad					0.3	(.18)
<i>R</i> ²	.10	(.02)	.41	(.03)	.42	(.03)
Chemistry						
1st generation non-refugees	95.1	(.56)	99.3	(.45)	100.0	(.61)
Refugees	-7.6	(.81)	-2.9	(.92)	-2.2	(1.0)
Socioeconomic status (HISEI)			0.7	(.37)	0.7	(.36)
Cultural capital (books)			0.8	(.36)	0.8	(.36)
German language proficiency			5.1	(.42)	4.9	(.42)
Duration of stay Germany					0.3	(.33)
Time in school Germany					0.2	(.31)
Time in school abroad					0.1	(.19)
<i>R</i> ²	.14	(.03)	.40	(.03)	.40	(.03)
Physics						
1st generation non-refugees	94.8	(.56)	99.2	(.45)	99.3	(.63)
Refugees	-9.8	(.80)	-5.0	(.88)	-4.7	(1.0)
Socioeconomic status (HISEI)			0.9	(.34)	0.8	(.33)
Cultural capital (books)			0.8	(.38)	0.9	(.37)
German language proficiency			5.1	(.41)	5.2	(.41)
Duration of stay Germany					0.4	(.34)
Time in school Germany					0.0	(.39)
Time in school abroad					0.4	(.19)
<i>R</i> ²	.20	(.03)	.46	(.03)	.47	(.03)

Notes. Regression coefficients for refugees represent differences in achievement scores on the reporting metric compared to other foreign-born students (1st generation non-refugees). Non-dummy variables (HISEI, books, language proficiency) were z-standardized. All coefficients are statistically significant ($p < .05$), exceptions are grayed out. $N_{\text{Mathematics}} = 1.507$; $N_{\text{Sciences}} = 1.461$. b = unstandardized regression coefficient, SE = standard error, R^2 = determination coefficient.

due to the pronounced collinearity of the time-related variables (see Table 1), the regression coefficients for these variables should be interpreted with caution.

4. Discussion

The present study determined the mathematics and science achievement of forcibly displaced students who have recently immigrated to Germany and compared it to the outcomes of other students with and without an immigrant background. The study further examined the degree to which key factors that are associated with immigrant students' educational disadvantages also account for the school achievement of refugee students. Using a dataset from a large representative sample of ninth-grade students, we found that, consistently across the four tested school subjects, refugee students reached considerably lower achievement scores than all other students, including non-refugee foreign-born students. The achievement gaps of 15 to 17 points compared to students without an immigrant background are equivalent to the learning gains of several school years in Germany – the *IQB Trends in Student Achievement 2018*-study reports average increases of up to 5 points per school year at the end of compulsory education in the total population (see Stanat et al., 2019). With estimated disparities of 7 to 10 points depending on the subject, refugee students' test scores also differed considerably from those of non-refugee first generation immigrants. These results suggest that much needs to be done in order to overcome educational disadvantages of refugees in the German education system.

Given the challenging learning conditions of refugee students (see section 1.2) and the relatively short time-period since their arrival in Germany, their substantial achievement disadvantages are not surprising. Yet, there is some indication that refugee students do better at school in other receiving countries. In a representative Australian study, the vast majority of refugee caregivers indicated that their children performed at or above average in school 2–3 years after arrival (Lau et al., 2018). Similarly, a review covering eight studies examining educational outcomes of refugee students attending secondary schools, most of them in North America, concluded that they reached similar educational outcomes as their native peers (Graham et al, 2016). Yet, the composition of the refugee populations in these studies differs from the refugee population in Germany in terms of their origin countries. Moreover, most of the studies were conducted in English-speaking countries, and the refugee students may have possessed some English skills at the time of their arrival. Even more important, the studies used grades, reports of caregivers/parents or teachers or information on school enrollment and completion as indicators of school success rather than achievement test scores. Some of these measures are prone to bias, most represent only broad categories that do not adequately reflect individual differences, and some may have less predictive validity for future educational and vocational success than achievement tests. The findings of our study are therefore not directly comparable to these findings. To arrive at a

more complete picture of how successful education systems are in integrating refugee students, international studies assessing multiple indicators of integration including the results of achievement tests are required.

As expected, differences in socioeconomic and cultural resources partly explained the achievement gaps between refugees and other students. The disparities between refugee students and students without an immigrant background were reduced by about one third when analyses considered parents' socioeconomic background and cultural capital. Yet, the family background explained the achievement gap to an even larger extent in non-refugee immigrants and particularly second-generation immigrants. This indicates that a mechanism that is well-established for other immigrant groups, namely that social inequality accounts for a considerable proportion of migration-related educational disparities (see section 1.2), also applies to refugee students. Yet, the effect seems to be somewhat smaller in this group. A potential explanation for this finding is the restricted transferability of the socioeconomic and cultural capital of refugees (see section 1.2). For instance, newly arrived refugees did not yet have many opportunities to accumulate cultural goods such as books in the receiving country or to find jobs corresponding to their educational background or vocational training. Consequently, their socioeconomic and cultural situation in Germany does often not reflect the socioeconomic and cultural resources they possessed prior to migration, which presumably have a strong impact on the educational success of their children. The current study addressed this issue by using information on the number of books refugee students' parents possessed in the origin country and on their last occupation prior to migration. However, when parents had started working in Germany below their qualification level or when information on the situation prior to migration was missing, the indicators did not assess their resources adequately. In consequence, it seems likely that the family background indicators are somewhat less valid for refugees than for the other groups examined in this study.

Proficiency in German as the language of instruction proved to be an even more important predictor of refugees' mathematics and science achievement than family background. Accounting for German language skills greatly reduced refugee students' disadvantages compared to students without an immigrant background; the remaining 2 to 5 points roughly equal the learning gains of one school year. The magnitude of this disparity is in line with previous findings for declarative knowledge in the sciences showing that recently arrived refugee students lag about one year behind a representative sample of ninth-graders in German schools (Schipolowski et al., 2019). Interestingly, refugees could take the tests administered by Schipolowski et al. (2019) in their first languages or in German, thus reducing potential effects of (limited) language skills.

For other foreign-born students, the estimated effects of German language proficiency were also pronounced in the present study. In all domains, accounting for German proficiency reduced first-generation immigrants' disparities compared to students without an immigrant background to a fraction of the initial effect; in mathematics and chemistry, the differences were no longer significant. German

proficiency by itself further explained 40 percent of the variance in mathematics and sciences achievement. These findings are in line with previous research, which consistently highlights the importance of the language of instruction for school learning and achievement of students of immigrant background (e.g., Kempert et al., 2016; Prevoo et al., 2016), including recently arrived immigrants (e.g., Suárez-Orozco, Bang, & Onaga, 2010). Note that the tests used to assess mathematics and science proficiency in this study were presented in German and that they posed considerable language demands in instructions and items. The close link between students' German proficiency and their test performance thus most likely stems from two sources: refugee students' actual proficiency in the tested domains, which relies on their language skills, as it, for instance, affects their capacities to understand classroom instruction and to seek clarifications from teachers and peers, and their ability to demonstrate their proficiency in the tests.

Our analyses focusing on first-generation immigrant students with and without refugee background provide insights into the similarities and differences between these two groups. Not surprisingly, differences in the family background and, particularly, in German proficiency also accounted for a considerable proportion of the disparities between refugees and other foreign-born students. Yet, as expected, even after considering these factors, a significant achievement gap between the two groups of 1 to 5 points remained, suggesting that additional factors contribute to the achievement disadvantage of refugees. Moreover, differences in the time spent in Germany, at a German school, and at schools in another country did not further reduce the disparities between refugee students and non-refugee foreign-born students once language proficiency and social background were taken into account. It thus seems that the achievement gaps are not due differences in schooling or length of stay *per se*, but rather to the groups' differential command of the language of instruction and other factors not considered in our analyses. This is surprising as interruptions in schooling and limited schooling experiences are often assumed to affect refugees' learning outcomes (Cerna, 2019; Dryden-Peterson, 2016). It is possible that our indicators did not capture refugees' pre-migration school experiences in enough detail. For instance, we did not assess how often students could temporarily not attend school in their countries of origin, where armed conflicts were often taking place for years. Furthermore, information about school attendance was missing for a considerable proportion of cases.

Other possible explanations for achievement gaps between refugees and other first-generation immigrants include pre-, peri-, and post-migration conditions (Ryan et al., 2008), including less effective education systems in refugees' origin countries as well as overburdened education systems and language barriers in transition countries, such as Turkey and Lebanon. Refugees hence may have entered the German school system with larger learning disadvantages than non-refugee immigrants. In addition, refugees have often experienced traumatic events, which can further impede their learning progress and the extent to which parents are able to support their children (McBrien, 2005; Wong & Schweitzer, 2017). Post-migration stressors, such as insecure residence status, crowded housing conditions and expe-

riences of rejection or discrimination, may affect refugee students' learning as well (Drydon-Peterson, 2016; McBrien, 2005).

Our study is limited in several respects. Its cross-sectional design does not allow to draw causal inferences or to analyze developmental processes. For newly arrived refugee students, it would be particularly interesting to investigate how their competencies develop over time in order to disentangle the degree to which the assessed competencies reflect what students had already learned before they arrived in Germany and what they have learned after their arrival. Furthermore, refugees in our study completed regular booklets in German. Administering translated versions of these booklets would potentially provide a more precise estimation of their mathematics and science proficiency and of the extent to which the achievement scores reflect domain knowledge on the one hand and language skills on the other. At the same time, in school and in vocational training, refugee students in Germany typically need to apply, further develop, and demonstrate their mathematical and scientific competencies in German. The ecological validity of our findings is therefore high for the German context.

Despite its limitations, our study provides several important insights and implications. It is the first empirical study determining the magnitude of achievement disadvantages of recently arrived refugee students in Germany based on established instruments and on data for a large representative sample. Moreover, it revealed similarities but also differences between refugee students and other foreign-born students. The disadvantages of refugees are much larger than the disadvantages of other first-generation immigrant students. These disparities cannot be fully explained by differences between the two groups in their sociocultural family background, German proficiency, residence time in Germany, time spent in a German school or in schools abroad. This suggests that additional mechanisms are at play in the case of refugees, which is in line with the notion that refugees have to overcome special challenges to succeed in school (Cerna, 2019; McBrien, 2005). The pronounced disadvantages of refugee students at the end of compulsory schooling underline how important it is to further support them in their learning after their transition to vocational training or to programs designed to prepare them for vocational training. Also, our findings emphasize once more that language proficiency is a key for educational success and needs to be an important focus in further developing educational quality in the German school system.

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APPENDIX

Table A1: Correlation estimates for refugees and non-refugee foreign-born students, respectively

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Mathematics achievement	–	.66	.70	.75	.61	.33	.38	.11	.12	-.12
2. Biology achievement	.48	–	.84	.84	.62	.26	.34	.22	.21	-.18
3. Chemistry achievement	.52	.68	–	.85	.62	.24	.32	.25	.26	-.24
4. Physics achievement	.60	.69	.69	–	.60	.25	.33	.21	.20	-.16
5. Language (C-test) ¹	.29	.38	.28	.37	–	.25	.37	.32	.35	-.33
6. Socioecon. status (HISEI)	.21	.14	.16	.20	.12	–	.35	.13	.09	-.08
7. Cultural capital (books)	.07	.12	.08	.11	.15	.16	–	.11	.10	-.09
8. Duration of stay Germany	-.04	.06	.05	.00	.03	-.02	.01	–	.79	-.69
9. Time in school Germany	-.08	-.03	.00	-.04	.00	-.07	.00	.43	–	-.74
10. Time in school abroad	.09	.16	.11	.22	.05	.16	.02	-.19	-.24	–

Notes. Values below the diagonal are correlation coefficients for the subsample of refugees ($n = 939$), values above the diagonal are correlations for the subpopulation of non-refugee foreign-born students ($n = 1,712$). All correlation coefficients are statistically significant ($p < .05$), exceptions are grayed out.

¹ Note that a floor effect was observed for refugees in the language test score (i.e., 77% of the refugees solved 5 or less out of 30 items correctly).

Table A2: Means and standard deviations for mathematics and science achievement test scores, the language test score, socioeconomic status (HISEI), and cultural capital (books) of refugees and other students with and without an immigrant background in Grade 9

	Mathematics			Sciences						
	N	M	SD	Biology		Chemistry		Physics		
				M	SD	M	SD	M	SD	
Total population	25,342	100.0	(.27)	10.0	(.26)	10.0	(.26)	10.0	(.27)	10.0
Without immigrant background	15,705	102.1	(.25)	9.4	(.24)	9.5	(.25)	9.5	(.25)	9.4
2nd generation	2,724	97.8	(.40)	9.5	(.38)	9.3	(.38)	9.4	(.38)	9.3
1st generation non-refugees	979	96.2	(.60)	10.1	(.58)	9.5	(.56)	9.4	(.56)	9.6
Refugees	528	87.4	(.70)	8.4	(.59)	7.8	(.63)	8.2	(.64)	8.0
	N	Language (C-test) ¹			HISEI			Cult. capital (books)		
		M	SD	(SE)	M	SD	(SE)	M	SD	(SE)
Total population	44,882	0.00	(.05)	1.87	50.7	(.39)	20.6	(.03)	3.50	(.03)
Without immigrant background	27,743	0.47	(.04)	1.76	54.1	(.40)	19.8	(.03)	3.83	(.03)
2nd generation	4,869	-0.53	(.06)	1.56	42.2	(.48)	19.6	(.04)	2.84	(.04)
1st generation non-refugees	1,712	-1.35	(.09)	1.73	44.8	(.99)	22.3	(.07)	2.77	(.07)
Refugees	939	-2.94	(.09)	1.43	42.5	(1.1)	21.5	(.07)	2.15	(.07)

Notes. SE = standard error. ¹ Weighted Likelihood Estimates (see text).

Elisabeth Maué, Claudia Diehl & Stephan Schumann

Young refugees in prevocational preparation classes: Who is moving on to the next step?

Abstract

Since 2015, an enormous number of refugees have migrated to Germany. To obtain qualified jobs, many of them attend prevocational preparation classes. The aims of these classes are mainly the acquisition of German language skills and preparation for subsequent vocational education and training. This paper examines (1) the transitions of young refugees after prevocational preparation classes and (2) what factors predict the transition to the next educational step.

Using data from the first two measurement points of a longitudinal survey (t1 during the prevocational preparation class and t2 one year later), we surveyed 333 students in Southwest Germany (82% male; mean age = 18.9 years). Instruments included an online questionnaire, an online test of cognitive ability, and an online test of German language skills. Approximately 37 percent of the students repeated the prevocational preparation class, whereas 60 percent moved on to the next educational step. German language skills at t1 and contact with people helping refugees (t1) predicted the probability of the transition to a “regular” educational pathway. Other variables, such as the educational background of the young refugees and of their parents, personality, motivation, and aspirations, had no significant effects. The findings can be interpreted in terms of the primary (language skills) and secondary effects of refugees’ ethnic background (information about the education system through contact with locals).

Keywords

Refugees; Vocational education and training; Transition system; Integration; German language skills

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Junge Geflüchtete in Vorbereitungsklassen: Wem gelingt der nächste Schritt?

Zusammenfassung

Seit 2015 ist eine große Anzahl Geflüchteter nach Deutschland gekommen. Viele von ihnen, insbesondere junge Menschen, besuchen sogenannte Vorbereitungsklassen an beruflichen Schulen. Ziele dieser Klassen sind vor allem der Erwerb von Deutschkenntnissen und die Vorbereitung auf eine spätere Berufsausbildung. Der vorliegende Beitrag untersucht (1) die Übergänge junger Geflüchteter nach der Vorbereitungsklasse und (2) welche Faktoren den Übergang in einen Regelbildungsgang vorhersagen.

*Zu den ersten zwei Messpunkten einer Längsschnittstudie (t1 in der Vorbereitungsklasse für Geflüchtete, t2 ein Jahr später) befragten wir 333 junge Geflüchtete im Südwesten Deutschlands (82% männlich; Durchschnittsalter = 18.9 Jahre). Zu den Instrumenten gehörten ein Online-Fragebogen, ein Online-Test der kognitiven Fähigkeiten und ein Online-Test der Deutschkenntnisse. Etwa 37 Prozent wiederholten die Vorbereitungsklasse, während 60 Prozent in einen Regelbildungsgang übergangen. Die Deutschkenntnisse zum ersten Messzeitpunkt sowie Kontakte zu Flüchtlingshelfer*innen (t1) erhöhen die Wahrscheinlichkeit auf den Übergang in einen Regelbildungsgang signifikant. Andere Indikatoren wie der Bildungshintergrund der Geflüchteten und ihrer Eltern, die Persönlichkeit, Motivation und Aspirationen hatten keine signifikanten Auswirkungen. Die Befunde können als primäre (Sprachkenntnisse) und als sekundäre Effekte der ethnischen Herkunft (Informationen über das Bildungssystem durch Kontakte zu Einheimischen) interpretiert werden.*

Schlagworte

Geflüchtete; Berufliche Bildung; Übergangssystem; Integration; Deutschkenntnisse

1. Introduction

Large numbers of refugees and asylum seekers have recently settled in Germany, especially in 2015 and 2016 (2015: 890.000; 2016: 280.000; BAMF, 2019, p. 8). Although the numbers have decreased since then, Germany was still the world's third largest recipient of new individual asylum applications in 2017 (UNHCR, 2018, p. 3). The integration of these migrants is a challenge for German society as a whole, but especially for the education system. Integration into the education system and the labor market is of crucial importance for refugees' equal participation in their new host country, which may in turn increase the public's acceptance of immigrants (Becker, 2011; Koopmans, 2015).

The refugees who have come to Germany since 2015 differ from earlier migrant groups in Germany. In the past, most migrants had been so-called "labor mi-

grants” (particularly from Turkey, Greece, Italy, and the former Yugoslavia), ethnic Germans (esp. from the former Soviet Union) and migrants from Eastern Europe (such as Poland and Bulgaria). Refugees who have arrived since 2015 have mostly come from non-European countries such as Syria, Afghanistan, Iraq, Iran, Eritrea, and Nigeria (BAMF, 2017, p. 18ff.). In these countries, the mean educational level is significantly lower than that in European countries (Bach et al., 2017; Brücker, Rother, & Schupp, 2017; Hanushek & Woessmann, 2015; Schier, 2017; Stoewe, 2017). Additionally, many refugees have disrupted their educational careers because they had to abruptly escape war and persecution and embark on extended trips (Diehl, Katsarova, Maué, & Schumann, 2017).

Due to their educational background and their age – 30 percent of the refugees in Germany in 2016 were between 16 and 25 years old (BAMF, 2017, p. 22) – many young refugees are either obligated (*Berufsschulpflicht*) or, depending on where they live in Germany, “allowed” to go to a vocational school (*Berufsschulberechtigung*). In vocational schools, these refugees typically have to attend special full-time prevocational preparation classes. These classes for refugees were established in 2015. The focus of these classes is to teach the German language, to provide basic vocational skills, and to keep refugees in the education system for a longer period of time. The characteristics of these classes vary between the 16 German federal states with regard to their duration (one or two years), the likelihood that students will gain a lower secondary school-leaving certificate and do an internship as well as the maximum age of participation (Baethge & Seeber, 2016; Grabinski, 2018).

Although refugees’ successful inclusion into the education system is key to their broader societal integration, little is known about the educational pathways of young refugees within the vocational education and training system. In our study, we analyze the role of different individual characteristics that shape early integration processes into the education system and the labor market (transition to apprenticeship or upper secondary education after attending prevocational preparation classes), as well as into society (extracurricular integration). To be more precise, this paper examines (1) how the educational transition of young refugees continues after prevocational preparation classes and (2) which factors enhance or hamper the transition from these classes to a “regular” vocational preparation class or other educational pathways.

2. Previous findings: Refugees in Germany’s education system

Since the arrival of numerous refugees in Germany in 2015, there has been a surge of research on their early integration patterns. These studies have described the characteristics of these newcomers and provided important information on how they were initially absorbed by the education system. The largest survey of refugees

in Germany took place in 2016 (the first point of measurement; since then, there have been several points of measurement). It was conducted with approximately 4,800 adult refugees who entered Germany between January 2013 and January 2016 and applied for asylum (IAB-BAMF-SOEP Survey of Refugees; Brückner et al., 2017), but some smaller and regionally more limited studies have been conducted as well, for example, in the federal state of Bavaria (Baumann & Riedl, 2016; Kärner, Feldmann, Heinrichs, Neubauer, & Sembill, 2016).

According to the IAB-BAMF-SOEP Survey of Refugees, the large majority of refugees attended school in their countries of origin (men: 90%, women: 83%), and most of them attended a secondary or upper secondary school. Although their average duration of schooling was ten years, there are large differences between the types of schools visited (Brenzel & Kosyakova, 2017, p. 19). Despite the relatively long average time of schooling, only less than one-fifth attended university or obtained a doctorate (with degree 12% of men and 14% of women). Over 70 percent did not attend vocational training (Brenzel & Kosyakova, 2017, p. 21), mainly due to the poor availability and/or reputation of vocational education in most of the countries of origin.

Findings from a survey of students in prevocational preparation classes in Bavaria point in a similar direction. According to this study, approximately half of the respondents attended school in their country of origin for nine years. However, the range extends from no school attendance to attendance for 15 years or longer (Baumann & Riedl, 2016, p. 90f.). Forty-two percent of the young refugees (men: 50%, women: 20%) reported work experience in their country of origin, mostly unskilled work (ibid., p. 102ff.). Overall, educational and vocational experiences vary between the different countries of origin, so educational and labor biographies are very heterogeneous among the group of refugees.

Previous studies have also suggested that the likelihood of the beginning of an apprenticeship for young refugees is increased by a German school-leaving certificate, work experiences in Germany through internships, introductory training (*Einstiegsqualifizierung*) or work on trial, and support from a mentor. In contrast, a foreign school-leaving certificate, work experiences in the country of origin, the course of study, participation in vocational preparation classes, the different ways of applying for an apprenticeship, the length of stay in Germany, and apprenticeship supply have no significant influence. There are no differences with regard to refugees' gender, age, and nationality (BA/BIBB-Fluchtmigrationsstudie 2016; Matthes et al., 2018, p. 35).

Comparing German and foreign apprentices, apprentices who arrived as refugees are predominantly male, older, have more often no or a lower secondary school-leaving certificate, do an apprenticeship more often in occupations with allocation problems (men), have a higher rate of prematurely terminated apprenticeship contracts (*Vorzeitig gelöste Ausbildungsverträge*) and have a lower success rate on the final examination (Kroll & Uhly, 2018, p. 17ff.).

In sum, previous findings underline the importance of Germany-specific cultural, human, and social capital for the vocational integration of refugees – es-

pecially German language skills, work experiences in Germany, and a German school-leaving certificate. However, little is known about refugees' transition from the prevocational preparation class to an apprenticeship or an alternative pathway – although these classes are the first point of contact with the German education system and the starting point for their further educational pathways.

This paper addresses this deficit by first describing young refugees' pathways after taking a prevocational preparation class. Second, we analyze which factors influence the successful transition from a prevocational preparation class to a regular vocational preparation class or to other educational pathways.

3. Educational transitions: Theoretical considerations

For the integration of young migrants and refugees, education plays an important role. Schools convey language skills, societal norms and values (Karakasoglu, 2013, p. 127; also Euler & Nickolaus, 2018) and can foster identification with their new host land. Furthermore, knowledge and competencies certificated by schools are crucial for their integration into the labor market (Kalter, 2006; Kalter & Granato, 2018), linguistic and cultural integration, and life chances (Diehl, Hunkler, & Kristen, 2016). Small ethnic differences in education can result in far-reaching ethnic inequalities during the life span.

In structured and strongly segmented education systems such as in Germany, transitions are of particular importance, since educational pathways are less easily corrected once taken due to limited permeability. Generally, the transition to an educational pathway is affected by students' parental background, which includes economic, cultural, and social capital (Bourdieu, 1983). Following sociological value expectancy theory (Boudon, 1974), students' social background directly influences their skills and competencies (primary effects of their social background) as well as their expectancy of success and the costs and benefits of different educational pathways (costs, status maintenance motive, value of education, chances of vocational education and jobs) that in turn shape their educational choices (secondary effect of the social background).

It has been shown (Diehl et al., 2016; Dollmann, 2017) that competencies and educational choices are influenced not only by students' social background but also by their ethnic background, which affects, above all, their skills in the host country's language. The knowledge of the language of the host country is in the focus of Esser's (2001) notion of "culturation", which is the process of gaining specific knowledge and abilities that facilitate daily life in the host country (Esser, 2001, p. 8f.)¹. The acquisition of language skills in the host country depends on the three

1 Esser distinguishes a total of four dimensions of integration: culturation, placement, interaction, and identification. "Placement" means taking up positions in socially relevant areas, such as the labor market or the education system (Esser, 2001, p. 9f.). "Interaction" refers to migrants' building of social contacts, which, in turn, can foster their integration in other areas – most importantly, the labor market (ibid., p. 10ff.). "Identifi-

“E”s: “Exposure to the host country language, Efficiency in learning a new language, and Economic incentives for learning the new language” (Chiswick & Miller, 2015, p. 228). The three Es reflect the conditions of the individuals themselves (e.g., human capital, age, and aspirations), the conditions of the ethnic community (e.g., family networks), and the conditions in the host country (e.g., education system) (Esser, 2001, 2006). The secondary effect of ethnic background is related to migrants’ higher educational aspirations (Dollmann, 2017; also Becker, 2010) because migrants are, in many cases, a positively selected group and often transfer their aims of advancement and of education to their children. Furthermore, they tend to aspire to higher school-leaving certificates as a means of combating discrimination in the labor market. Another – this time negative – secondary effect of ethnic background is the often limited knowledge of the education system and the lower availability of information about possible educational pathways and regulations regarding transitions (Dollmann, 2017).

By focusing on the impact of social or ethnic background on educational transitions, factors on the individual level apart from skills and competencies, such as students’ personality, are not yet fully taken into account even though they also matter. The psychological expectancy-value theory of motivation (Eccles et al., 1983) has similar basic assumptions to those of Boudon (1974) and Bourdieu (1983) regarding the importance of different aspects of the student’s family background (e.g., cultural milieu) and individual characteristics (e.g., aspirations) for achievement-related performance and choices. However, the focus is on individual psychological aspects and their effects. The student’s affective reactions and memories, goals and general self-schemas (e.g., self-concept of one’s abilities, short- and long-term goals, and perceptions of task demands), his/her interpretation of experiences, expectations of success and perception of the socializer’s beliefs, expectations, attitudes and behaviors as well as the subjective task value mediate the influence of the student’s background. The student’s achievement-related choices and performance (in our case, the transition) depend less on the objective value of the choice of an educational pathway but more on the relative subjective value compared to alternative educational pathways (see Heckhausen & Heckhausen, 2010, p. 454).

In sum, several indicators of the students’ family background, namely, their human, social, economic, and cultural capital, and their personality, motivations, aspirations, and experiences need to be taken into account when analyzing educational transitions. For migrants, their ethnic background additionally affects resources available to a student as well as educational transitions. Refugees constitute a heterogeneous group and originate from conditions unique from those experienced by other migrants. It remains an open question how the educational skills and certificates gained in their country of origin help for their educational career in the host country. The same is true for migrants’ social and cultural

cation” is measured as migrants’ identification with the social systems and their feeling of belonging to the host society (ibid., p. 12ff.). The four dimensions are related to each other and are mutually dependent.

resources related to their country of origin. Through transmission processes, parental education shapes the child's acquisition of skills and knowledge. For refugees, this process of intergenerational transmission can be expected to be more disruptive since family networks have been uprooted during the migration process. Since their parents acquired their education in a different context, they may also be less helpful in the host society. For the expectancy of success as well as the assessment of the costs and benefits of different educational pathways, refugees (like all students) need knowledge about the education system and the labor market in the host country. However, this knowledge that is key for making the "right" choices may be difficult for them to acquire.

4. The German context: Young refugees in vocational education and training

Vocational education and training is a strong backbone of secondary education in Germany, offering several tracks with basic trainings, apprenticeships, and academic colleges. Doing an apprenticeship is key to obtaining a qualified nonacademic job in Germany (Bergseng, Degler, & Lüthi, 2019). An apprenticeship offers a standardized qualification and training and often leads to permanent employment (BIBB, 2020, p. 258f.). Therefore, doing an apprenticeship can be seen as the first step toward integration into the labor market. For refugees in particular, it can also increase the chances of being allowed to legally stay in Germany (see below).

One part of vocational education and training is the so-called "transition system", which includes partially qualifying training classes for an intermediate school-leaving certificate and vocational qualifications. Other classes are more "preparatory" in nature and offer vocational orientation but not the option to acquire a school-leaving certificate (Euler & Nickolaus, 2018, p. 527). In response to the large influxes in 2015 and 2016, prevocational preparation classes for young refugees were established in vocational schools as part of the transition system. These classes are the most important source of German language instruction for refugees (Baumann & Riedl, 2016). Additionally, students gain access to important information about the education system. They get ready to start an apprenticeship and develop vocational aspirations, which are important preconditions for ending up in an occupation requiring formal training (*Ausbildungsberuf*) that is often considered "appropriate", given refugees' ages and preexisting skills (Baethge & Seeber, 2016; Grabinski, 2018).

In the state of Baden-Württemberg, where we collected our data, prevocational preparation classes for refugees last one year. At the end of the school year, there is a German language level assessment at level A2 or B1 according to the Common European Framework of Reference for Languages (CEFR). When a student successfully completes the language level assessment (usually A2 according to the CEFR), a certificate is granted. These students can remain in the prevocation-

al preparation class to acquire level B1 or B2. Students who do not pass the language level assessment or cannot yet pass it meaningfully (e.g., because of a short duration of attendance when starting school during the year) can repeat the prevocational preparation class (MKJS, 2016, p. 12f.). For the transition from the prevocational preparation class to regular preparation classes that offer the opportunity to achieve a lower secondary school-leaving certificate, young refugees should know the German language at level A2. Even though there are no formal entry restrictions to some of the regular preparation classes with regard to a certain level of German language skills, level B1 is recommended based on previous experience (MKJS, 2018, p. 12).

After the prevocational preparation class, most young refugees attend a regular preparation class that offers the opportunity to obtain a lower secondary school-leaving certificate, as intended by educational policy. This certificate increases the chances that they can find an apprenticeship or move on to upper secondary school and complete a higher school-leaving certificate. Nevertheless, other educational pathways are also an option. For example, it is formally possible (though empirically rare; BIBB, 2020, p. 131) to start an apprenticeship even without a school-leaving certificate.

However, the transition to an apprenticeship is particularly challenging for refugees. First, refugees need sufficient German language skills (ideally at level B2 or higher) – not only to understand their work but also to pass the vocational school part of the apprenticeship². Second, the apprenticeship and/or work permit depends on the asylum status of the refugees. An investment in the apprenticeship of refugees is only worthwhile for companies if they do not have to fear deportation of their apprentices and workers. The so-called “apprenticeship tolerance” (3+2 regulation, *Ausbildungsduldung*) is intended to give both refugees and employers planning security: their stay is secured for the duration of the apprenticeship (usually three years). After successful completion of the apprenticeship, refugees can obtain a two-year residence permit if they can take up a job that corresponds to their apprenticeship. Third, it can be difficult for companies to identify the competences and qualifications that refugees gained in their country of origin. This may be due to missing certificates from the country of origin and to the question of the comparability and transferability of competences and work experiences from the country of origin (Scheiermann & Walter, 2016, p. 15f.; also, Ebbinghaus & Gei, 2017). Apart from these specific conditions for refugees, the supply-demand ratio of free apprenticeship places generally varies by region, vocational sector, and occupation (BIBB, 2020).

2 In Germany, apprenticeships in many occupations are organized in the “dual system” and last for two to three and a half years, depending on the occupation. The apprenticeship is carried out in two places of learning: at the workplace and in a vocational school. Instruction at the vocational school takes place on either one or two days per week or in blocks every few weeks. The rest of the time, the apprentices work in their company and are instructed there.

Starting out from the findings of previous studies, the theoretical assumptions outlined above, and the institutional context, we expect the transition from a prevocational preparation class to a regular vocational preparation class or another educational pathway to be shaped by the refugees' educational background (i.e., their and their parents' education achieved before migration), skills (cognitive abilities and language skills), personality, aspirations, and social capital in Germany (ties to majority members).

5. Data and methods

To answer our research questions on the transition after the prevocational preparation class to a regular educational pathway, data from the first two points of measurement (t1 and t2) of a longitudinal survey with a total of four points of measurement³ among young refugees in prevocational preparation classes were used.

Sample and procedure at t1: First, we selected all vocational schools with at least one prevocational preparation class in the southwestern district of Freiburg (n = 52). This district is located in the German federal state of Baden-Württemberg. Second, the school principals were invited to participate in the study. Finally, 22 school leaders agreed to participate with their classes. Members of the research team carried out the data collection in all prevocational preparation classes at these 22 schools between May and July 2017 using the schools' computer labs. All refugees who were present at the school on the agreed day participated voluntarily (only one refusal; in total: n = 635). Because of erroneous class lists and official information, the total population size is not known, and a participation quota cannot be calculated.

Procedure at t2 (March to August 2018): The 22 schools informed the research team how many of the students that were surveyed at t1 were still learning at the school and which students had left (e.g., transition to apprenticeship, work, other schools, moving, drop out, unknown). For those who were still at school, data collection was quite similar to the procedure at t1. If the students were only absent from school that day (e.g., due to illness), a short paper-pencil questionnaire was left for them and returned to the research team by postal service. Those who did not send back the short paper-pencil questionnaire or who left the school after the prevocational preparation class received a link by email and/or smartphone to a short online questionnaire (consent to contact and the collection of contact data was given at t1). A total of 228 refugees were reached in the schools for the second survey, and 34 refugees returned the short paper-pencil questionnaire. The link for the short online questionnaire was sent to 240 refugees (two reminders were sent, and a voucher worth €20 was offered as an incentive to participate)⁴. Eighty-two individuals filled out this questionnaire, and 71 were analyzed (11 refugees filled out

3 The third survey took place in 2019 through individual qualitative interviews with 32 young refugees. The fourth survey will be conducted in 2021.

4 No contact data were available for 144 refugees.

the short paper-pencil questionnaire and the short online questionnaire because the paper-pencil questionnaires were received later. In these cases, the short paper-pencil questionnaire was evaluated). The majority of these refugees still attended school (86%). Based on this fact and the drop-out analyses (Table 1), it can be assumed that those who did not participate in the second measurement did not significantly differ from those who did participate.

The *longitudinal sample* consisted of 333 students (longitudinal participation rate: 52%). Eighty-two percent of the students were male, and 18 percent were female. This gender distribution fits the official statistics almost perfectly (BAMF, 2017, p. 22). The mean age at t1 was 18.6 years (SD = 2.27, n = 321), with a range from 15 to 30 years. Most refugees came from Syria (30%) and Afghanistan (24%), as well as from Iraq (11%), Eritrea (6%), and Gambia (5%). Dropout analyses revealed no significant differences in aspects such as German language skills, cognitive ability, personal characteristics, aspirations, networks, or educational background between young refugees who participated in the second measurement and those who did not.

To handle missing values, a multiple imputation with 20 datasets was conducted with SPSS 27. The method was a fully conditional specification (an iterative Markov chain Monte Carlo; MCMC) that uses all variables described in Table 2 (single items instead of scales) and further variables with substantial correlations with these variables (e.g., secondary virtues punctuality and regular attendance at school, self-assessment of German language skills) as predictors in a linear regression analysis. By means of predictive mean matching, the imputed values were compared with the next observed value, causing the data to be imputed within the permissible value ranges of the variables. All cases at t1 were used for the multiple imputation, with the following exceptions: Before the multiple imputation was performed, young refugees in a prevocational preparation class with a specialized focus on literacy were excluded because they were eligible only to make the transition to a regular prevocational preparation class (n = 7). Refugees with an unrealistically long (n = 12) or a very short (fewer than six months; n = 23)⁵ duration of stay in Germany were also excluded to prevent possible bias. For example, a repetition of the prevocational preparation class after only two months of school attendance would be counted as “repetition”, even though not even half a school year had been completed. This repetition is not “real” in the sense of the analyses. Moreover, those refugees who left the education system at t2 were excluded (n = 10) because they were not the focus of the analyses and were not included in the linear probability model (see below). In total, data from n = 583 refugees were used for the multiple imputation. Overall, the longitudinal data for the analyses here consist of n = 302 young refugees.

5 Regardless of the status of their asylum application, refugees usually have the obligation or right (depending on their age) to attend school three months after coming to Germany. School attendance can begin in the middle of the school year and even in the last quarter.

Table 1: Drop-out analyses: Comparison of participants only of first measurement and longitudinal sample (original data)

Variable (t1)	Range	Only t1			Longitudinal sample			Difference		
		M	SD	N	M	SD	N	t	p	d
German language skills	WLE	0.79	1.44	289	0.88	1.41	326	-0.836	.403	-0.068
Cognitive ability	WLE	-0.36	1.56	285	-0.24	1.51	310	-0.907	.365	-0.074
Achievement motivation	1 = Is not true at all 6 = Is absolutely right	5.52	0.60	235	5.61	0.47	249	-1.818	.070	-0.166
Self-efficacy	1 = Strongly disagree 6 = Strongly agree	4.94	0.81	95	4.99	0.58	96	-0.567	.571	-0.082
Short-term aspiration: German school leaving certificate	0 = No / Uncertain 1 = Yes	0.80	0.40	267	0.84	0.37	300	-1.190	.235	-0.101
Long-term aspiration: live in Germany	0 = No / Uncertain 1 = Yes	0.81	0.40	288	0.78	0.42	312	0.900	.369	0.073
Contacts to German students	1 = Never / no Germans known 5 = Every day	2.83	1.35	272	2.75	1.30	284	0.721	.471	0.061
Contacts to Germans helping refugees	0 = No 1 = Yes	0.50	0.50	259	0.54	0.50	275	-0.926	.355	-0.080
Education in country of origin	School years	7.40	3.67	261	7.64	3.35	314	-0.816	.415	-0.069
Education of father ^a	1 = No diploma 4 = University Degree	2.22	1.14	191	2.27	1.14	237	-0.491	.624	-0.043
Education of mother ^a	1 = No diploma 4 = University Degree	1.96	1.08	189	1.97	1.07	233	-0.107	.915	-0.011

Note. ^a Without category "I don't know".

Instruments and variables: Questionnaires and instructions were available in seven languages (Arabic, English, Farsi, French, German, Pashto, and Tigrinya). The first point of measurement included an online test of cognitive ability (CFT 20: subtests "series" with 24 multiple-choice items; Weiß, 1980), an online test of German language skills at level A1 according to the CEFR (30 multiple-choice items with three distractors; developed in-house; EAP-reliability: $t_1 = 0.89$), and an online questionnaire. If the young refugees did not have sufficient computer skills, they took paper-pencil tests and filled out a short version of the questionnaire by hand. The instruments of the study were piloted in advance with 111 refugees in seven prevocational preparation classes in four vocational schools in another

er administrative district in Southwest Germany. The aim of the second survey was the analysis of changes between the two points of measurement as well as the investigation of transitions to apprenticeship or to other educational pathways after the prevocational preparation class. For the second point of measurement, questions on changes, e.g., in education, were added to the questionnaire.

To empirically model the educational transitions of young refugees, a *linear probability model* (with Mplus version 8, Muthén & Muthén, 1998–2017) proves the influence of several predictors of the first point of measurement on the educational pathway at the second point of measurement. The educational pathway at the second point of measurement as the *dependent variable* has several categories for different options in the education system (e.g., transition system, upper secondary school) or the labor market (e.g., internship, apprenticeship) (see Table 3). Due to insufficient cell occupancy of the individual connections to prevocational preparation classes, these are summarized in the linear probability model with a dichotomous variable: repetition of the prevocational preparation class for refugees (coded as 0) or a regular educational pathway (coded as 1) (see Table 4). Only those students who remained in the education system are of interest – either as repeaters of the prevocational preparation class or as those who have made the transition. Those who left the education system, for example, to work, are not considered in the linear probability model.

Independent variables: We use the education in the refugees' country of origin (school years) and their parents' highest educational qualification as indicators for the educational background. The scores of the tests of cognitive ability and German language skills are used as performance indicators. Achievement motivation and self-efficacy serve as indicators for the personalities of the young refugees. Contacts with German students and contacts with people helping refugees represent potential sources of information on the education system. These persons can also offer suggestions for possible educational pathways and provide their own contacts and networks for the realization of an educational aspiration of the refugees (social capital in the host country). The plan to achieve a German school-leaving certificate (no or uncertain versus yes) is used as a short-term educational aspiration. Due to insufficient cell occupancy, the categories "No", "Maybe", and "I don't know" are combined. The desire to stay in Germany forever versus the desire to live in a different country or yet not having plans serve to indicate their long-term life aspirations. Gender, age, the duration of stay in Germany until the first point of measurement, the time between the two points of measurement, and the country of origin function as *control variables*. Due to insufficient cell occupancy, only Afghanistan, Iraq, and Syria can be shown individually. To account for the nonlinearity of the dependent variable, a binary logistic regression analysis was also calculated as a robustness check. Its results point in the same direction as the linear probability model.

Table 2: Descriptive statistics of the variables used in the linear probability model

Operationalization	Variable	min. & max. / specification	%	Pooled M (SD) ^a
<i>Dependent variable (second point of measurement t2)</i>				
Class at t2		0 = Pre-vocational class 1 = Other regular educational pathway	38% Pre-vocational class 62% Other educational pathway	
<i>Independent variables (first point of measurement t1)</i>				
German language skills	Test score ^b	-4.80 to +4.68		0.97 (1.37)
Cognitive ability	Test score ^b	-4.76 to +3.69		-0.19 (1.47)
Achievement motivation	Scale with 4 items: $\alpha = .73$ ^c	1 = Is not true at all. 6 = Is absolutely right.		5.60 (0.49)
Self-efficacy	Scale with 6 items: $\alpha = .82$ ^e	1 = Strongly disagree. 6 = Strongly agree.		4.88 (0.58)
Short-term aspiration	Plan to achieve German school-leaving certificate		82% Yes 18% No / Uncertain	
Long-term aspiration	Preferred country to live in		78% Germany 22% Not in Germany / I don't know.	
Contacts to German students	Speak with German students in school	1 = Never / know no German students 5 = Every day		3.48 (1.71)
Contacts to Germans helping refugees		0 = No 1 = Yes	47% No 53% Yes	
Education in country of origin	School years	0 to 14 school years		7.64 (3.37)
Highest education of parents			19% I don't know. 24% No diploma 16% Lower ranked diploma 20% Higher ranked diploma 22% University degree	

Table 2 continued

Table 2 continued

Operationalization	Variable	min. & max. / specification	%	Pooled M (SD) ^a
<i>Control variables (first point of measurement t1)</i>				
Gender			81% Man 19% Woman	
Age		15 to 30 years		18.63 (2.35)
Time in Germany until t1	Duration of stay in Germany	7 to 43 months		18.92 (5.82)
Time between t1 & t2		8 to 14 months		11.01 (1.53)
Country of origin			24% Afghanistan 11% Iraq 30% Syria 34% Other country of origin	

Notes. ^a Longitudinal sample: n = 302; Multiple imputation (n = 20 datasets). ^b Weighted likelihood estimate WLE, generated with ACER ConQuest version 2.0 (Wu, Adams, & Wilson, 1997). ^c Original data t1 full sample (n = 484); Example: I am willing to study a lot for German class. ^d Original data t1 full sample (n = 408); Example: I try to do all tasks very thoroughly. ^e Original data t1 full sample (n = 191); Example: I am able to realize my intentions and goals.

6. Results

Descriptives of the transitions: As Table 3 shows, 47 percent of the refugees entered a regular vocational preparation class after the prevocational preparation class for refugees to obtain a lower secondary school-leaving certificate. In contrast to this successful “next step”, 37 percent had to repeat the prevocational preparation class. A small proportion (8%) attended schools that led to an intermediate or an upper secondary school-leaving certificate. The direct transition to an apprenticeship or to an introductory training, which can be credited to the apprenticeship if successfully completed, was realized by 5 percent of the refugees. Two percent attended a language course to increase their German language skills. The results show that almost all of the refugees in the longitudinal sample remained in the vocational education and training system.

Table 3: Educational pathway or current occupation at the second point of measurement (original data)

Educational pathway	n	%
<i>Within education system</i>		
Repetition of prevocational preparation class	105	36.8
Class for lower secondary school-leaving certificate	133	46.7
Class for intermediate school-leaving certificate	21	7.4
(Vocational) upper secondary school	1	0.4
Introductory training	1	0.4
Apprenticeship	14	4.9
<i>Outside education system</i>		
Internship	1	0.4
Work	3	1.1
Language course / Adult Education Center	6	2.1
Total	285	100.0

Notes. Missing Values: n = 27. Exclusion due to very short (fewer than six months) or unrealistically long duration of stay in Germany or due to attendance of a prevocational preparation class with a specialized focus on literacy: n = 21

Prediction of transition: In the linear probability model, only those students who followed an educational pathway (n = 302) are considered. Those who left the system (n = 10) are not included in this analysis. The dependent variable is the educational pathway at the second point of measurement – either the repetition of the prevocational preparation class for refugees or the entry into a regular educational pathway.

Table 4: Linear probability model (dependent variable: repetition of prevocational preparation class vs. transition to regular educational pathway; pooled standardizes coefficients; multiply imputed data: $n = 302$)

	β
<i>Achievement</i>	
German language skills	.465 ***
Cognitive ability	.040
<i>Personality</i>	
Achievement motivation	.054
Self-efficacy	-.036
<i>Aspirations</i>	
German school leaving certificate	.009
Live in Germany	.022
<i>Social capital</i>	
Contacts to German students	.009
Contacts to Germans helping refugees	.119 *
<i>Educational background</i>	
Education in country of origin	-.046
Highest education of parents: Reference: No diploma	
I don't know	.051
Lower ranked diploma	.095
Higher ranked diploma	.045
University degree	.112
<i>Control variables</i>	
Gender	.029
Age	.089
Time in Germany until t1	-.020
Time between t1 & t2	.005
Country of origin: Reference: Syria	
Afghanistan	.056
Iraq	-.102
Other country of origin	.115
Intercept	-.434
R^2	.322

Notes. *: $p < .05$; **: $p < .01$; ***: $p < .001$.

German language skills, as measured by performance on the German test, have a major influence ($\beta = .47$; $p < .001$) on the probability of the transition to an educational pathway other than the prevocational preparation class. Interestingly, refugees' social capital, i.e., their contact with people helping refugees, also increases the probability of this transition ($\beta = .12$; $p < .05$).

Indicators of cognitive ability, personality (achievement motivation and self-efficacy), and educational background (number of school years in the country of origin and highest educational qualifications of parents) have no significant effects on the probability of the transition from the prevocational preparation class to a regular educational pathway and neither do the short-term aspiration to obtain a German school-leaving certificate or the long-term aspiration to stay in Germany. The same

is valid for contact with German students. The control variables also have no significant effects. The model explains 32 percent of the variance.

7. Discussion

Given their age, educational background, and legal status, a substantial portion of young refugees in Germany attends prevocational preparation classes at vocational schools. These classes aim to impart German language skills, to provide vocational orientation for students, and are a first step in preparing them for an apprenticeship. Integration into the German labor market through vocational education and training is also desirable from a political perspective. Thus, analyzing the educational transition after these kinds of classes and the next step in refugees' educational careers is important.

According to our study, the overwhelming majority of refugees remained in the vocational education and training system after the prevocational preparation class. Almost 60 percent of our respondents entered the next educational step, mainly a regular vocational preparation class (leading to a lower secondary school-leaving certificate); 37 percent (had to) repeat the prevocational preparation class for refugees, which was most likely a result of insufficient German language skills.

The finding that the majority made the transition into an educational pathway that offers a lower secondary school-leaving certificate and at least one internship fits with other studies showing that (young) refugees want to acquire a German school-leaving certificate (e.g., Liebau & Siegert, 2017) and to do an apprenticeship (Weber & Guggemos, 2018). A German school-leaving certificate and internships are important preconditions for a successful transition to an apprenticeship (Matthes et al., 2018; Stöbe-Blossey, Köhling, Hackstein, & Ruth, 2019). Internships offer information about specific occupations and provide vocational experiences, vocational orientation, and contacts to companies. Refugees can demonstrate their skills as well as their motivation and commitment. Because internships are an integral part of regular vocational preparation classes, refugees who managed to enter these classes increase their chances for an apprenticeship.

One important finding is that the political goal to keep as many refugees as possible in the (vocational) education system for longer is overall achieved, given that the transition to unskilled work does not seem to be an attractive and often chosen alternative for young refugees.

Our second main finding – that German language skills are key in the transition to a regular educational pathway – underscores the importance of language skills for refugees' integration into the education system and labor market (Esser, 2001; Kalter, 2006). It is also in line with the formal regulation of level A2 requirements according to the CEFR.

Contacts to people helping refugees are also positively related to the probability of attending a regular educational pathway. As part of refugees' social capital, they

provide important information and knowledge about the education system and the labor market (Boudon, 1974; Bourdieu, 1983; Esser, 2001). This finding is in line with previous research that points to the importance of mentors for the transition to an apprenticeship and to employment (Matthes et al., 2018).

We did not find support for theoretical assumptions on the influence of personality, motivation, and aspirations on educational transitions (Becker, 2010; Becker, 2017; Boudon, 1974; Eccles et al., 1983; Heckhausen & Heckhausen, 2010). Obviously, the acquisition of the German language as well as first orientation in Germany must first be mastered successfully before other aspirations can be pursued (Stöbe-Blossey et al., 2019, p. 50ff.). In addition, formal regulations for transition that emphasize the importance of German language skills could limit the influence of refugees' personality, motivation, and aspirations on this transition.

According to our study, parents' educational background and the length of schooling in the country of origin do not influence the educational transitions. Education systems in the country of origin are possibly very different from those in Germany such that even parents with higher educational qualifications can only provide limited help and support to their children after migration. In addition, many parents cannot support their children because they are currently learning the German language themselves. Finally, many young learners arrive as unaccompanied minors. In sum, with regard to the transition from prevocational preparation classes to a regular educational pathway, German language skills are crucial compared with all other factors known to influence educational transitions.

Further research should focus on the next steps of young refugees. Only the long-term perspective will show whether refugees succeed in integrating into (vocational) education, the labor market, and society and whether they are able to realize their aspirations. Examining the further educational careers and life paths of displaced children and youth as well as uncovering factors that promote or hinder their integration will be important tasks for educational researchers in the years to come. This would also contribute to the question of whether previous findings and theoretical assumptions on the educational pathways of students with a migrant background can be transferred to the group of refugee students.

Because the study took place in only one district in Germany, the transferability of the findings to other federal states in Germany or even to other countries cannot be taken as granted even though there is little reason to assume that the results look substantively different for other parts of the country. What is more important are sample selection effects that are related to the fact that many students in the respective classes were absent when we collected our data. Those students included in our survey can thus be expected to be "positively selected" in terms of their school success in many regards. And finally, analyses focus on the transition from prevocational preparation classes to another educational pathway. No conclusions can be drawn in this paper about those who left the education system or had to leave it, for example, to work or to leave Germany.

Despite these limitations, our study provides valuable information about the schooling of young refugees in the context of vocational education and training.

Learning the German language is of enormous importance for educational success as well as for integration. For good reason, the main focus of prevocational preparation classes is teaching the German language. However, other subjects (e.g., mathematics) as well as vocational orientation should not be disregarded. They are also crucial for basic vocational education and the choice of a suitable apprenticeship and occupation. In addition, the question arises of how the learning of subject content and of technical language can be linked to the acquisition of the German language (in the sense of integrated learning of language and subject; Settlemeyer, Münchhausen, & Schneider, 2019).

Furthermore, schools not only impart knowledge and skills but also contribute to the social integration and the social capital of refugees by creating contact opportunities between local and refugee youth. This issue touches on the question of whether refugee children and youth learn better in integrated or separated classes and how long they should remain in the latter (Karakayalı, zur Neiden, Kahveci, Groß, & Heller, 2017). It seems important that refugees, at the latest after their transition to a regular educational pathway, attend classes together with local youths to integrate into the broader society.

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Cornelia Kristen & Julian Seuring

Destination-language acquisition of recently arrived immigrants: Do refugees differ from other immigrants?

Abstract

This article describes new immigrants' levels of destination-language proficiency shortly after taking up residence in Germany. The focus lies on a comparison of refugees from Syria with new arrivals from Italy, Poland, and Turkey, who came as economic immigrants, for family reasons, or as students. The theoretical account builds upon a well-established model of language acquisition, according to which language fluency is a function of exposure, efficiency, and incentives. The empirical study is based on data from the first wave of the ENTRA project ("Recent Immigration Processes and Early Integration Trajectories in Germany") that covers about 4,600 young adults. The analyses reveal that most individuals improve their proficiency over time. Syrians' experience a faster learning curve than those of other immigrant groups. The conditions identified as relevant to language fluency largely reflect the findings of previous studies. They indicate that language learning is a general process that, for the most part, does not differ across the four groups. Exposure is the major force driving language acquisition. There are also indications that certain kinds of exposure, such as attending language classes, are especially beneficial for individuals with lower resource endowments. In addition, Syrian refugees profit more than other new arrivals from increased levels of language exposure, such as from taking language courses, pursuing education or being active on the labor market.

Keywords

New immigrants; refugees; language proficiency; Germany

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Spracherwerb von Neuzuwanderern: Unterscheiden sich Geflüchtete von anderen Migranten?

Zusammenfassung

Im vorliegenden Beitrag werden Muster des Spracherwerbs von Neuzuwanderern beschrieben, welche in jüngerer Zeit nach Deutschland gekommen sind. Der Schwerpunkt liegt auf dem Vergleich syrischer Geflüchteter mit Migranten aus Italien, Polen und der Türkei, die als Arbeitsmigranten, im Zuge der Familienzusammenführung oder für Bildungszwecke eingewandert sind. Die theoretischen Überlegungen beruhen auf einem allgemeinen Modell des Spracherwerbs, wonach drei zentrale Konstrukte beim Erlernen einer Sprache relevant sind: Exposure, Effizienz und Motivation (bzw. Anreize). Für die empirische Studie werden Daten des ENTRA Projekts herangezogen („Aktuelle europäische Binnen- und Flüchtlingsmigration nach Deutschland: Zuzugsprozesse und frühe Integrationsverläufe“), im Rahmen dessen Informationen zu etwa 4,600 jungen Erwachsenen gesammelt wurden. Die Analysen belegen, dass die meisten Neuzuwanderer ihre Sprachkenntnisse im Zeitverlauf verbessern. Der Zuwachs unter syrischen Geflüchteten fällt dabei deutlicher als in den anderen Gruppen aus. Die für den Spracherwerb gegenwärtiger Neuzuwanderer gefundenen Zusammenhänge entsprechen in weiten Teilen den Befunden früherer Studien. Es wird geschlussfolgert, dass es sich beim Spracherwerb um ein allgemeines Phänomen handelt, das sich in unterschiedlichen Gruppen in ähnlicher Weise vollzieht. Die Schlüsselrolle beim Spracherwerb spielen die Sprachgelegenheiten. Außerdem zeigt sich, dass bestimmte Arten von Exposure, etwa der Besuch von Sprachkursen, für Personen, welche ansonsten über weniger Ressourcen verfügen, besonders vorteilhaft sind. Die Befunde belegen darüber hinaus, dass syrische Geflüchtete in stärkerem Maße als Neuzuwanderer aus anderen Gruppen von Sprachgelegenheiten profitieren, die sich aus der Teilnahme an Sprachkursen, aus dem Besuch von Bildungseinrichtungen oder aus einer Tätigkeit auf dem Arbeitsmarkt ergeben.

Schlagworte

Neuzuwanderer; Geflüchtete; Spracherwerb; Deutschland

1. Introduction

A large body of empirical evidence points to proficiency in the language of the destination country¹ as central to immigrants' incorporation into their host society. Skills in the dominant language are essential for making and maintaining contacts

1 Throughout this study, we use the terms “language skills” and “language proficiency” interchangeably. In so doing, we intend to cover a broad range of language-related competences without referring to a particular domain (Kristen, Mühlau, & Schacht, 2016, p. 204).

with majority members, and thus for establishing social relationships across ethnic boundaries (Martinovic, van Tubergen, & Maas, 2009; Schacht, Kristen, & Tucci, 2014). They are also key to immigrants' and their offspring's success in the education system and the labor market. For instance, language skills are required for learning that takes place in the destination country's educational institutions, and thereby shape individuals' achievements (Alba, Sloan, & Sperling, 2011; Azzolini, Schnell, & Palmer, 2012; Schnepf, 2007); they are also needed when searching for adequate employment and generating income (Chiswick & Miller, 1995; Dustmann & Fabbri, 2003). In structural terms, as well as in many other ways, destination-language proficiency is fundamental to navigating everyday life and to succeeding in a society that can be profoundly different from the one left behind.

In this article, we aim to describe the levels of German-language proficiency that different groups of recently arrived immigrants display shortly after taking up residence in Germany. These skills are indicative of their future integration prospects. Our main focus lies on the comparison of refugees from Syria with new arrivals from Italy, Poland and Turkey, who came as economic immigrants, for family reasons or as students. Given that Syrian refugees left their home country in a time of war and violent conflict, they differ in certain respects from immigrants who came to Germany for other reasons and under different circumstances. For example, refugees are more likely to have experienced a dangerous journey to Europe, and they usually have a different legal status after immigration (Spörlein, Kristen, Schmidt, & Welker, 2020).

The theoretical account builds upon a general model of language learning, according to which language skills are a function of the efficiency with which immigrants learn a new language, the incentives for investing in its acquisition (i.e., the motivation to learn), and the degree of exposure to this language (Chiswick & Miller, 1995; 2001). We argue that the basic processes associated with the three constructs of the model apply rather generally to the different immigrant groups under study. That means that new immigrants are expected to respond to most conditions in similar ways, no matter of their origin, or their motive for migrating. Differential patterns may nevertheless emerge, because the groups under study are likely to differ on a range of these conditions. Therefore, rather than reasoning that the processes of language learning have to be addressed in a profoundly different or new way in the case of refugees, we follow arguments which consider refugee migration as a special case of migration that is subject to similar regularities (Kogan & Kalter, 2020).

This empirical study is based on data from the first wave of the ENTRA project ("Recent Immigration Processes and Early Integration Trajectories in Germany"). The data were collected in 2019 and cover about 4,600 young adults (aged 18 to 41 years) from Syria, Italy, Poland, and Turkey who came to Germany between July 2015 and February 2019.

Unlike other existing data collections that exclusively focus on refugees, the ENTRA survey includes a range of other immigrant populations who came to Germany during a similar period. Poles were selected as a typical case for Eastern

European immigration; Italians as an example for immigration from Southern Europe, which increased substantially in the aftermath of the financial crises; and Turkish people have been included as an immigrant group that has frequently been considered to be difficult to integrate (Crul & Vermeulen, 2003), and which, due to being composed mainly of Muslims, faces bright boundaries in the European context (Alba, 2005).

2. Theoretical account

Language proficiency is a form of human capital that is embodied in a person (Chiswick & Miller, 1995, p. 248; 2001, p. 391). Its acquisition requires a variety of investments (*ibid.*) that can include deliberate efforts to improve linguistic skills, such as attending a language course, as well as activities that immigrants may not necessarily perceive as language-related, for example, talking to members of the majority population (Kristen, et al., 2016, p. 182). Given the wide range of potentially relevant investments that individuals may engage in before, as well as after migration, language learning is perceived as a cumulative outcome of repeated and prolonged investments in skill-increasing behaviors (Espenshade & Fu, 1997; Esser, 2006a; 2006b; Kristen, 2019, p. 522).

According to the general model of language acquisition, investments differ depending on the *incentives* for learning the new language (i.e., the learning motivation), the degree of *exposure* to this language and the *efficiency* with which individuals improve their proficiency per unit of exposure (Chiswick & Miller, 1995; 2001). This model has been applied across disciplines, and many researchers have elaborated on the processes underlying these basic dimensions.

We base our subsequent reasoning both on theoretical arguments discussed in the literature, as well as on the body of empirical evidence accompanying these considerations (for an overview see Kristen, 2019). We start with the premise that the basic processes associated with the three constructs of the model apply rather generally (Esser, 2006a; 2006b; Kristen, et al., 2016, p. 203). That is, immigrants of different origins respond to most of the conditions that are relevant for language learning in rather similar ways. For example, talking to a native speaker or attending a language course increases exposure to the dominant language and should be uniformly beneficial to language learning (e.g., Braun, 2010; Chiswick & Miller, 2001; Kristen, et al., 2016; Stevens, 1999; van Tubergen, 2010). In a similar vein, individuals who intend to stay and settle down in the destination country, or who feel emotionally attached to the new context should be more inclined (i.e., have greater incentives) to invest in becoming fluent compared to individuals who plan to go back to their origin country or who feel more detached from their destination society (e.g., Espenshade, & Fu 1997; Kristen, et al., 2016; Phinney, Romero, Nava, & Huang, 2001; van Tubergen, 2010). The notion of a general logic underlying language fluency also applies to the reasoning on efficiency, meaning that those

with a greater capacity for learning should become proficient at a faster pace (e.g., Chiswick & Miller 1995; 2001; Dustmann & Fabbri, 2003; Espenshade & Fu, 1997; Stevens, 1999; van Tubergen & Kalmijn, 2005).

Group-specific patterns may nevertheless occur because distinct immigrant groups have experienced certain situations or particular conditions that are less common in other groups. In other words, whenever different origin groups systematically diverge from each other in characteristics that are relevant for any of the three dimensions of the basic model, a differential pattern is expected to appear. For example, if members of a certain immigrant group are more likely to attend a well-designed language course that is known to be efficient than members of a different immigrant group, these discrepant investments should be reflected in a differential linguistic development.

Given our interest in Syrian refugees and the ways in which their situation diverges from, but also aligns with that of other new arrivals who came to Germany during a similar period, in the following, we highlight a selection of conditions that may set contemporary refugees apart from other recent immigrants.

An important difference concerns refugees' legal status. Until a final decision about their residential status is made, refugees cannot be confident about their prospects of remaining in their destination country. This kind of insecurity should be absent among Italians and Poles who, as members of the European Union, are free to settle down and work anywhere in Europe. Insecurities, in turn, are expected to lead to a more reluctant investment behavior (Hvidtfeldt, Schultz-Nielsen, Tekin, & Fosgerau, 2018; Kosyakova & Brenzel, 2020; van Tubergen, 2010).

In addition, post-traumatic stress is more common among individuals who fled their home country in times of war and violent conflict, and who experienced dangerous and life-threatening events on their journey to a different destination (Dietrich, Al Ali, Tagay, Hebebrand, & Reissner, 2019). Given this greater prevalence of related health problems in refugee populations, and considering that poor mental health is associated with cognitive impairment (Medalia & Revheim, 2002; Trivedi, 2006), individuals who struggle in this regard, may also be less efficient learners.

An additional efficiency component relates to group differences in the distribution of educational qualifications. Given that educational expansion in Syria has not progressed as far as it has in Italy, Poland, or Turkey, it is hardly surprising that Syrian refugees are on average less educated. The less educated segments of the Syrian refugee population, in addition, include illiterates, while individuals who cannot read and write are virtually non-existent in the other immigrant populations under study.² Accordingly, a lack of formal instruction may impose an extra burden on poorly educated individuals who, due to a disadvantaged starting position, may face greater difficulties when acquiring a new language.

2 According to the World Bank, the most recently available numbers for people aged 15 and older point in Syria to a literacy rate of 81 percent (2004), in Italy of 99 percent (2018), in Poland of 99 percent (2008), and in Turkey of 96 percent (2017; <https://data.worldbank.org/indicator/SE.ADT.LITR.ZS>).

Moreover, Syrians in the early months after arrival often stayed in collective accommodation. Living in such circumstances may have restricted their exposure to native speakers. However, most Syrians in our sample had left these centers quite some time before the interview, so that so that they should have no longer been suffering from the disadvantage of being separated from the majority population.

The reception of refugees was accompanied by substantive efforts on the part of the German government to provide language training, and many Syrian refugees made use of these opportunities (Brenzel, et al., 2019, p. 71; Brücker, et al., 2019; Kosyakova & Brenzel, 2020). Structured exposure in formal settings is known to raise proficiency, so that higher participation rates among Syrian refugees should lead to greater linguistic gains.

Given that being exposed to a new language is of central relevance to its acquisition (Kristen, 2019, p. 524; Braun, 2010; Chiswick, & Miller, 2001; Stevens, 1999), and in view of recent findings that suggest that language instruction contributes significantly to new immigrants' language fluency (e.g., Brenzel, et al. 2019, pp. 73–78; Kristen, et al., 2016), we further argue that structured exposure as provided by language courses can compensate, to some extent, for a lack of resources that are relevant for learning, such as cognitive skills or cultural capital. Although this reasoning applies to all groups, compensatory processes may be more of an issue among contemporary refugees, considering their oftentimes limited endowment with these resources.

3. Research questions for the empirical study

We start the empirical part with an illustration of new immigrants' destination-language proficiency and ask how they perform upon arrival and at the time of the first interview. This initial step allows differences in linguistic skills to be identified between different groups of recent immigrants.

Thereafter, we study a range of conditions that reflect the three constructs of the general model of language acquisition, and analyze whether these conditions are associated with language improvement. Based on this account, as well as on prior research that points to the central role of language exposure, we ask whether certain constellations and certain kinds of exposure are of special relevance to language learning.

In a final step, we take a closer look at group-specific patterns and investigate how Syrian refugees differ from other new immigrants. Correspondingly, we address features that are specific to refugees and investigate their association with proficiency. With this additional step, we also tackle the question of whether different immigrant groups respond in similar ways to the conditions captured by the various indicators of the model of language learning.

4. Data and methods

4.1 Data

The empirical study is based on data from the first wave of the ENTRA project (“Recent Immigration Processes and Early Integration Trajectories in Germany”), which were collected in 2019. The ENTRA survey is designed as a two-wave-panel study of selected immigrant groups, in which about 4,600 recent arrivals aged between 18 and 41 were interviewed. At the time of the first survey, they had been living in Germany for between 1 and 52 months. The data collection of the second wave will be completed at the beginning of 2021.

The ENTRA project covers contemporary refugees from Syria, as well as new immigrants from Italy, Poland and Turkey who came to Germany as labor immigrants, for family reasons or as students. Respondents were sampled based on a two-stage sampling design that was applied separately to each immigrant group. In the first stage, based on registration data from the German Federal Office of Statistics, for each group, we selected the five cities that had the largest immigrant inflows. In the second stage, from the registration data, we drew a random sample of our target persons (i.e., all individuals aged 18 to 41 who had citizenship of a country of origin of interest to us, and who registered in the selected German cities between July 2015 and February 2019). In order to obtain a sufficiently large number of addresses of new immigrants, we requested information from the registry offices twice, in September 2018 and in March 2019. The sample is typical for recent immigrant populations in urban areas, but it is not representative. Representativeness is particularly relevant for the description of characteristics in a population. As this is not feasible with our data, we refrain from pursuing this route. Instead, we concentrate on analyzing how a range of conditions shapes the process of language learning.

All target persons received an invitation letter in their native language in which they were offered a monetary incentive to participate in the study. These letters were dispatched in two batches with a time lag of two months. Respondents could choose to take the survey online, via telephone, or face-to-face. Interviews took on average 43 minutes ($SD = 24$ minutes), but with variation across modes (i.e., face-to-face interviews took about 15 minutes and telephone interviews about 10 minutes longer than online interviews). Since Turkish and Syrian individuals were asked more questions (e.g., regarding their legal status, or their journey to Germany) their interviews took between 5 and 10 minutes longer than those of the other groups. Face-to-face interviews were predominantly conducted in public spaces such as cafés or parks; only about 30 percent were carried out in the respondents’ homes. All interviews were administered in the respective languages (i.e., in Arabic, Italian, Polish, and Turkish).

4.2 Measures

Destination-language proficiency at the time of the first interview is a composite index consisting of information on respondents' self-assessed competences in understanding, speaking, reading, and writing German on a scale from 0 ("not at all") to 5 ("on a native speaker level"). The measure shows a high degree of internal consistency (Cronbach's alpha = 0.96), with the underlying variables loading on a single factor (eigenvalue = 3.54).

We also consider language proficiency at the time of arrival. This measure is based on the more general question of how well respondents knew German before moving to Germany. In contrast to the measurement at the time of the first interview, it does not address different linguistic dimensions, such as speaking or reading. This additional instrument is important to our account in two ways. First, it allows the development of language proficiency to be traced over time (i.e., between entry [t_0] and the first interview [t_1]). Second, we use it to control for a range of pre-migration conditions that are relevant to the level of proficiency at the time of entry, so that we can concentrate on investments that take place in the early period after arrival.

Table 1: Variable definitions

Name	Definition
German language proficiency t_1	Average score of respondents' self-reporting on how well they can (1) understand, (2) speak, (3) read, and (4) write German. Answer categories range from 0 "not at all" to 5 "on a native speaker level".
German language proficiency t_0	Respondents were asked how well they knew German before they moved to Germany. Answer categories range from 0 "not at all" to 5 "a native speaker level".
Intention to stay in Germany	Respondents were asked how much longer they planned to stay in Germany. They could indicate (1) a specific time span in years, or one of the following answers: (2) "less than one year", (3) "it depends on the circumstances", (4) "forever", or (5) "don't know". We distinguish between 1 "Temporary" (1 & 2), 2 "Depends on circumstances" (3 & 5), and 3 "Forever" (4).
Residence permit	Distinguishes between 1 "No permit", 2 "Pending/tolerated", 3 "Temporary permit", and 4 "Permanent permit" (Turks and Syrians only).
Closeness to Germany	Based on the question "How connected do you feel with Germany?". Answer categories range from 0 "I do not feel a connection at all" to 4 "I feel an extremely close connection".
Age	Measured in years.
Cognitive skills	Based on a test assessing perceptual information-processing speed similar to the <i>Digit-Symbol-Test</i> applied in the German Socio-Economic Panel (Lang et al., 2007). Respondents had to match symbols with correct numbers using a correspondence table in which nine symbols are assigned to numbers. In a 90-second task, symbols were randomly shown and the respondents had to enter the corresponding number (1–9). Test scores represent the number of correctly solved items.

Table 1 continued

Table 1 continued

Name	Definition
Education in CO	Highest educational degree completed in country of origin (CO) based on the ISCED-97 classification. Distinguishes between 0 “None/primary/lower secondary” (ISCED 0–2), 1 “Upper secondary” (ISCED 3–4), and 2 “Tertiary” (ISCED 5–6).
Mental health	Average score of six items of the <i>Kessler Psychological Distress Scale</i> (K-6; Kessler et al., 2003), e.g., “During the past month, about how often did you feel hopeless?”. Answer categories range from 0 “almost all of the time” to 4 “none of the time”.
CO literacy	Average score of respondents’ self-reporting of how well they can (1) read and (2) write Arabic (Syrians only). Answer categories range from 0 “not at all” to 5 “on a native speaker level”. The average scores were assigned to a dummy variable to distinguish between respondents who 1 “can read and write Arabic at least well (i.e., individuals with an average score of 3–5)” and 0 “score below (0–2.5)”.
Duration of stay	Difference between the date of the interview and the date of arrival (in years).
Investment in language skills	Respondent were asked whether they had done anything to improve their German since moving to Germany. If “yes” they were asked to specify their activities (e.g., “took language classes” or “learned through self-study”). We coded the answers as a dummy variable, assigning any investment to 1 except for integration/language courses, which were coded into a separate variable.
Language/integration course	Variable indicating whether respondents participated in a German language or integration course with 0 “No” and 1 “Yes”.
Language certificate	Highest level of German language certification received (if participated in language/integration course) based on the classification of the <i>Common European Framework of Reference for Languages</i> : 0 “No course attended”, 1 “None/A1/A2”, 2 “B1/B2”, and 3 “C1/C2”.
In education	Variable indicating whether respondents are currently enrolled in education with 0 “No” and 1 “Yes”.
Employed	Variable indicating whether respondents are currently working with 0 “No” and 1 “Yes”.
Language use	Respondents were asked how often they speak German with (1) their partner, (2) their children, (3) friends, (4) other people in everyday life (e.g., colleagues, neighbors), and (5) how often they watch movies or TV, listen to the radio, read newspapers, magazines or books in German. Answer categories range from 0 “never” to 4 “always”.
Partner/children	Average score of language use with partner (1) and children (2). Respondents without partner and children were assigned a value of 0.
Friends/other people	Average score of language use with friends (3) and other people (4).
Media consumption	Answer to item (5).

To cover the three constructs of the model of language acquisition, we use a range of indicators, many of which are well established in the literature (for an overview, see Kristen, 2019). Table 1 provides the full definitions of all variables, Table 2 information about their distributions according to the different groups of new immigrants.

Table 2: Descriptive statistics (means and percentages) according to country of origin

	Range	Missing (in %)	Total (N=4,571)		Italy (N=1,110)		Poland (N=1,107)		Turkey (N=1,094)		Syria (N=1,260)	
			Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
German language proficiency t_1	[0–5]	0.3	2.54	1.21	2.45	1.47	2.46	1.20	2.31	1.14	2.90	0.93
German language proficiency t_0	[0–5]	0.7	1.06	1.38	1.23	1.66	1.49	1.36	1.30	1.25	0.33	0.83
Incentives												
Intention to stay in Germany (in %)		0.7										
Temporary			15.4		24.6		16.8		17.8		3.9	
Depends on circumstances			59.2		62.2		65.0		54.8		55.2	
Forever			25.5		18.2		18.2		27.4		41.0	
Residence permit (in %)		6.0										
No permit			1.5		-		-		1.7		1.3	
Pending/tolerated			7.8		-		-		6.1		9.2	
Temporary permit			86.0		-		-		85.8		86.1	
Permanent permit			4.8		-		-		6.4		3.4	
Closeness to Germany	[0–4]	2.2	2.24	1.02	2.00	0.93	1.87	1.07	2.34	1.00	2.68	0.91
Efficiency												
Age	[18/41]	0.0	28.71	5.49	28.28	5.24	28.96	5.30	28.97	5.74	28.65	5.63
Cognitive skills	[10/57]	7.4	36.62	7.44	37.92	6.81	38.34	6.85	37.10	7.13	32.19	7.53
Education in CO (in %)		2.6										
None/primary/lower secondary			12.7		5.9		3.7		9.7		28.9	
Upper secondary			39.7		47.0		32.4		35.1		44.0	
Tertiary			47.6		47.1		63.9		55.3		27.1	
Mental Health	[0–4]	1.3	2.82	0.81	2.98	0.73	2.70	0.76	2.78	0.81	2.82	0.90
CO literacy (in %)		0.0	-		-		-		-		97.1	

Table 2 continued

Table 2 continued

	Range	Missing (in %)	Total (N=4,571)		Italy (N=1,110)		Poland (N=1,107)		Turkey (N=1,094)		Syria (N=1,260)	
			Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Exposure												
Duration of stay (in years)	[0–4.3]	0.2	2.36	1.22	2.02	1.11	2.01	1.11	1.82	1.04	3.42	0.84
Investment in language skills (in %)		1.1	47.8		36.9		60.5		41.8		51.3	
Language/Integration course (in %)		6.4	78.4		69.8		68.0		80.5		92.1	
Language certificate (in %)		7.2										
No course			21.8		30.7		32.3		19.6		8.0	
None/A1/A2			32.9		33.4		37.6		41.5		22.0	
B1/B2			31.8		25.0		20.4		28.3		49.0	
C1/C2			13.5		10.8		9.7		10.7		21.0	
In education (in %)		1.3	28.1		25.9		19.9		34.8		31.5	
Employed (in %)		1.2	60.2		78.0		76.4		52.0		37.4	
Language use: Partner/Children	[0–4]	0.4	0.79	1.17	0.76	1.28	0.73	1.13	0.92	1.18	0.75	1.07
Language use: Friends/other people	[0–4]	0.3	2.09	1.23	2.09	1.35	2.09	1.25	1.85	1.22	2.32	1.07
Language use: Media consumption	[0–4]	0.4	1.94	1.23	1.77	1.29	1.85	1.20	1.80	1.22	2.30	1.14
Controls												
Female (in %)		0.2	48.3		51.8		64.3		43.8		34.9	
Survey mode (in %)		0.0										
Online			76.6		88.7		95.7		79.3		46.8	
Telephone			14.7		8.7		3.3		16.7		28.3	
Face-to-face			8.7		2.6		1.1		4.0		24.8	
Second recruitment batch (in %)		0.0	36.0		32.2		0.0		30.7		75.6	

Regarding incentives, we include the *intention to stay* in Germany, the type of *residence permit*, which provides the legal basis for individuals to assess their prospects of permanent residence, as well as the degree of *closeness to Germany* felt by respondents as an indicator of emotional attachment. In terms of efficiency, we consider the respondent's *age*, *cognitive skills* captured using the Symbol-Digit Test (SDT), a speed-constrained measure of information-processing capacities (Lang, Weiss, Stocker, & von Rosenbladt, 2007)³, the level of education acquired in the country of origin (i.e., *education in CO*), and whether the individual had acquired *CO literacy*. We further consider *mental health*, as poor mental health is associated with the impairment of cognitive functioning (Medalia & Revheim, 2002; Trivedi, 2006).

Exposure is measured by the *duration of stay* at the time of the first interview, by a variable that records whether respondents made any efforts since their arrival to improve their level of proficiency (i.e., *investment in language skills*), whether they took up a *language* or *integration course* and, if so, which *language certificate* they obtained, whether they are currently *in education*, and whether they are presently *employed*. We also include three indicators of *language use* that are known to be of great importance to acquiring the destination language (Braun, 2010; Chiswick & Miller, 2001; Espenshade & Fu, 1997; Kristen et al., 2016; Stevens, 1999): language use with their *partner and children*, language use with *friends and other people*, and language use in *media consumption*.

As controls, we include the respondent's *sex*, the *survey mode* (i.e., face-to-face, telephone, or online), and whether the individual belongs to the first or the second *recruitment batch*. When presenting findings for the whole sample, we also include a control for the *country of origin*.

4.3 Analytical strategy

In the following, we analyze the development of immigrants' destination-language proficiency shortly after their arrival in Germany, applying linear regression. To address item nonresponse, we use multiple imputation and estimate 50 datasets with complete information (Allison, 2001). Following Rubin's (1987) approach, we combine the results of the analyses performed on each dataset. Descriptive results (presented in Table 2 and Figure 1) are based on the original data.

Immigrants in the ENTRA survey arrived in Germany between July 2015 and February 2019. Within this period, Italians, Polish and Turkish immigrants' dates of arrival were spread relatively evenly over the whole time period, while Syrians' dates of arrival were concentrated in the second half of 2015. This is in line with the observation that most refugees from Syria came to Germany in 2015, and that thereafter, there was a substantial decline (Statistisches Bundesamt, 2019).

3 Respondents in the telephone mode were offered an additional incentive to take the test online. They received an email with a link to the test and then participated in the same way as in the regular online mode.

These group-specific entry patterns are reflected in a longer average duration of stay ($M = 41$ months) and a smaller dispersion of this measure ($SD = 10$ months) among Syrians compared to the other immigrant groups ($M = 24$ months for Italians and Poles and $M = 22$ months for Turkish respondents, $SD = 13$ months for all groups). Therefore, characteristics that are typically related to the duration of stay will also vary less among Syrians. This reduced variation can affect estimations of the associations of these variables with destination-language proficiency. They might turn out to be smaller among Syrians than they would have been if the data contained a more dispersed distribution of Syrian immigrants across the full range of the arrival spectrum.

5. Results

5.1 Destination-language proficiency upon arrival and at the time of the first interview

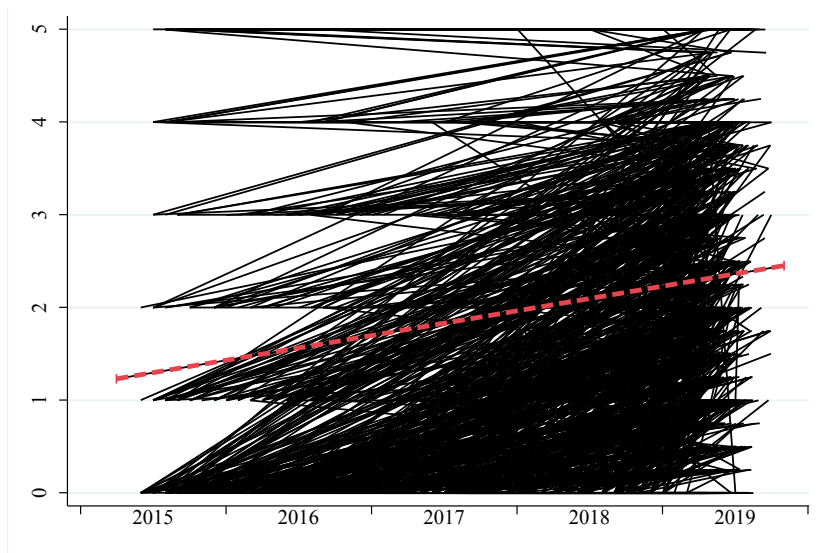
Figure 1 illustrates the development of new immigrants' self-assessed German-language proficiency. Each line represents a single immigrant. Its onset indicates the proficiency level at the time at which the individual entered Germany; the end of the line indicates the proficiency level at the time at which the interview took place. Given that individuals in our sample immigrated between July 2015 and February 2019, the lines can start anywhere within this spectrum. The end points concentrate in 2019, when the interviews were conducted.

In addition to illustrating individual developments, Figure 1 for each group includes the overall trend (i.e., the red dashed line). For each immigrant group, the red dashed line depicts the average change in fluency that took place in the early period after arrival. The onset and the end of the trend lines correspond to the averages specified in the first two rows of Table 2.

The first important finding is that almost everyone gains proficiency over time. Among Syrians, the trend line and many of the underlying single lines are steeper than those of the other groups. A reason for this pattern could be that Syrians were far more likely to be entering Germany much with no German language skills, while Italian, Polish and Turkish immigrants had more frequently already acquired some German before migrating. Typically, when learning a new language from scratch, rapid progress is made, and the learning curve is steeper than among those who already have acquired a certain skill level (Hartshorne, Tenenbaum, & Pinker, 2018). This reasoning is also supported by the finding that group differences in proficiency levels are less pronounced at the time of the first interview than upon arrival.

Figure 1: Destination-language proficiency upon arrival and at the time of the first interview

a. Italy



b. Poland

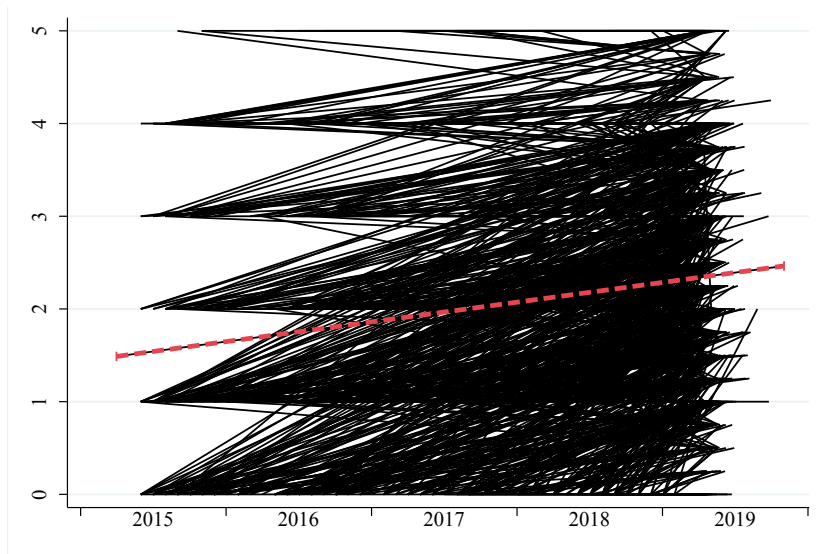
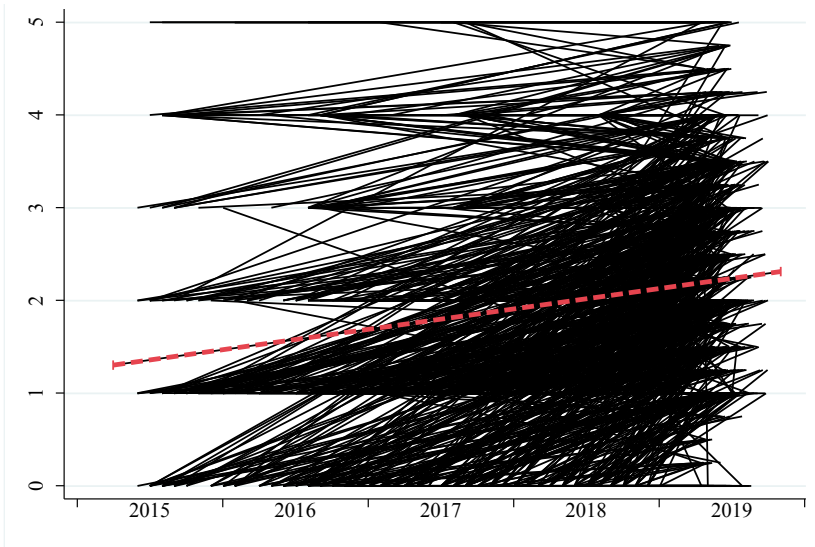


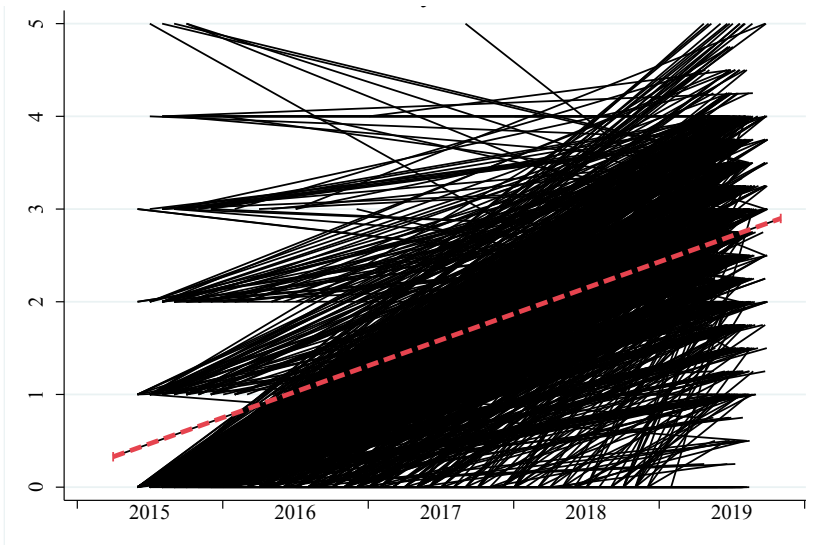
Figure 1 continued

Figure 1 continued

c. Turkey



d. Syria



5.2 Empirical findings on the conditions shaping destination-language proficiency

Following the assumption that immigrants of different origins who came to Germany for different reasons respond to most of the conditions that are relevant for language learning in rather similar ways, we start by presenting findings on the pooled sample before we move on to discuss group-specific patterns.

Table 3 presents the results of linear regressions of destination-language proficiency ordered according to the three constructs of the general model of language acquisition. The empirical evidence on the relevance of incentives is less consistent than it is for the other two constructs of efficiency and exposure (Model 1). Contrary to the expectation that those who intend to stay in Germany forever, rather than temporarily, are more motivated to learn German and therefore achieve greater fluency, we find a negative coefficient, which suggests that the reverse is true.⁴ In terms of emotional attachment, the results are in line with our reasoning: they indicate that individuals who feel close to Germany display a greater improvement in language proficiency. These opposing patterns reflect the results of other empirical studies, which point to inconsistent evidence on incentives (e.g., Espenshade, & Fu, 1997; Kristen et al., 2016; van Tubergen, 2010). One reason contributing to these inconsistencies could be that it is difficult to disentangle motivation from exposure components, especially in a cross-sectional design. As such, the intention to stay may work as an incentive for improving language skills and provide the basis for self-selection into contexts that offer exposure to the dominant language. Therefore, in a model that at the same time captures exposure and incentives, it can be difficult to isolate these temporally intertwined components.⁵

In contrast to the evidence on motivational features, the results on efficiency largely correspond to the findings of previous studies. Immigrants who arrive at a younger age learn a new language faster. In a similar vein, the better educated and those with greater cognitive skills show greater language improvements, possibly due to an enlarged capacity for learning. For mental health, in contrast, we do not find an association with language proficiency.

The third construct, exposure, is the key to acquiring a new language. This is abundantly clear in our study. The coefficients for almost all conditions that signal exposure to German-speaking environments are significant, and point in the expected direction. A longer duration of stay, making an effort to improve one's skills including taking up language courses, attending an educational institution and, above all, language use are all positively related to language acquisition. In relative terms, the use of German outside the core family is one of the most important conditions for learning the new language (not shown here). The only exception to the

4 This counterintuitive result remains unaltered when excluding feelings of closeness to Germany from the model (not shown here).

5 In a separate analysis (not shown here), we excluded the variables on exposure from Model 1. In this case, the negative coefficient for those who intend to stay forever changes into a non-significant positive coefficient.

Table 3: Linear regressions of destination-language proficiency

	Model 1		Model 2		Model 3a		Model 3b		Model 4		Model 5a		Model 5b	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
German language proficiency t_0	0.38***	(0.01)	0.37***	(0.01)	0.50***	(0.01)	0.49***	(0.02)	0.36***	(0.01)	0.38***	(0.01)	0.37***	(0.01)
Incentives														
Intention to stay in Germany (ref. temporary)														
Depends on circumstances	-0.03	(0.03)	-0.02	(0.03)	-0.03	(0.03)	-0.02	(0.03)	-0.03	(0.03)	-0.03	(0.03)	-0.03	(0.03)
Forever	-0.09**	(0.03)	-0.06	(0.03)	-0.09**	(0.03)	-0.08*	(0.03)	-0.09**	(0.03)	-0.09**	(0.03)	-0.09**	(0.03)
Closeness to Germany	0.04***	(0.01)	0.04***	(0.01)	0.04***	(0.01)	0.04***	(0.01)	0.04***	(0.01)	0.04***	(0.01)	0.04***	(0.01)
Efficiency														
Age	-0.03***	(0.00)	-0.03***	(0.00)	-0.03***	(0.00)	-0.03***	(0.00)	-0.03***	(0.00)	-0.03***	(0.00)	-0.03***	(0.00)
Cognitive skills ^a	0.03*	(0.01)	0.02	(0.01)	0.03*	(0.01)	0.03*	(0.01)	0.03*	(0.01)	0.09*	(0.02)	-0.06*	(0.02)
Education in CO (ref. none/primary/lower secondary)														
Upper secondary	0.18***	(0.03)	0.09**	(0.03)	0.16***	(0.03)	0.18***	(0.03)	0.17***	(0.03)	0.17***	(0.03)	0.19***	(0.03)
Tertiary	0.31***	(0.04)	0.19***	(0.04)	0.30***	(0.04)	0.32***	(0.04)	0.31***	(0.04)	0.31***	(0.04)	0.33***	(0.04)
Mental health	0.01	(0.01)	0.02	(0.01)	0.01	(0.01)	0.01	(0.01)	0.01	(0.01)	0.01	(0.01)	0.01	(0.01)
Exposure														
Duration of stay (in years)	0.32***	(0.04)	0.30***	(0.04)	0.29***	(0.04)	0.43***	(0.04)	0.30***	(0.04)	0.33***	(0.04)	0.32***	(0.04)
Duration of stay ²	-0.03***	(0.01)	-0.03***	(0.01)	-0.03**	(0.01)	-0.04***	(0.01)	-0.03**	(0.01)	-0.03***	(0.01)	-0.03***	(0.01)
Investment in language skills	0.06**	(0.02)	0.05*	(0.02)	0.08***	(0.02)	0.06**	(0.02)	0.06**	(0.02)	0.07**	(0.02)	0.06**	(0.02)
Language/integration course (ref. no)	0.30***	(0.03)												
Language certificate (ref. no course)					0.57***	(0.03)	0.28***	(0.03)	0.52***	(0.04)	0.31***	(0.03)	0.30***	(0.03)
None/A1/A2														
B1/B2														
C1/C2														

Table 3 continued

Table 3 continued

	Model 1		Model 2		Model 3a		Model 3b		Model 4		Model 5a		Model 5b	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
In education	0.18***	(0.02)	0.12***	(0.02)	0.17***	(0.02)	0.19***	(0.02)	0.18***	(0.02)	0.18***	(0.02)	0.19***	(0.02)
Employed	-0.02	(0.02)	-0.03	(0.02)	-0.02	(0.02)	-0.01	(0.02)	-0.02	(0.02)	-0.02	(0.02)	-0.02	(0.02)
Language use: Partner/ children	0.02*	(0.01)	0.03**	(0.01)	0.02*	(0.01)	0.02*	(0.01)	0.02*	(0.01)	0.02*	(0.01)	0.02*	(0.01)
Language use: Friends/ other people	0.35***	(0.01)	0.31***	(0.01)	0.34***	(0.01)	0.34***	(0.01)	0.44***	(0.02)	0.35***	(0.01)	0.35***	(0.01)
Language use: Media consumption	0.12***	(0.01)	0.11***	(0.01)	0.11***	(0.01)	0.12***	(0.01)	0.11***	(0.01)	0.12***	(0.01)	0.12***	(0.01)
Interaction: exposure*level of proficiency upon arrival														
Language/integration course*German language proficiency t_0					-0.19***	(0.02)								
Duration of stay*German language proficiency t_0							-0.05***	(0.01)						
Interaction of different forms of exposure														
Language/integration course*Language use: Friends/other people									-0.12***	(0.02)				
Interactions: exposure*efficiency														
Language/integration course*Cognitive skills											-0.08**	(0.03)		
Language use: Friends/ other people*Cognitive skills													0.04***	(0.01)

Table 3 continued

Table 3 continued

	Model 1		Model 2		Model 3a		Model 3b		Model 4		Model 5a		Model 5b	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
Controls														
Country of origin (ref. Syria)														
Italy	-0.39***	(0.04)	-0.28***	(0.04)	-0.39***	(0.04)	-0.35***	(0.04)	-0.39***	(0.04)	-0.38***	(0.04)	-0.39***	(0.04)
Poland	-0.45***	(0.04)	-0.32***	(0.04)	-0.41***	(0.04)	-0.41***	(0.04)	-0.45***	(0.04)	-0.45***	(0.04)	-0.45***	(0.04)
Turkey	-0.48***	(0.04)	-0.38***	(0.04)	-0.46***	(0.04)	-0.43***	(0.04)	-0.47***	(0.04)	-0.48***	(0.04)	-0.48***	(0.04)
Female	0.06**	(0.02)	0.05**	(0.02)	0.07**	(0.02)	0.07**	(0.02)	0.06**	(0.02)	0.07**	(0.02)	0.06**	(0.02)
Survey mode (ref. face-to-face)														
Online	0.02	(0.04)	-0.01	(0.04)	0.02	(0.04)	0.02	(0.04)	0.02	(0.04)	0.02	(0.04)	0.01	(0.04)
Telephone	-0.02	(0.04)	-0.05	(0.04)	-0.02	(0.04)	-0.03	(0.04)	-0.02	(0.04)	-0.02	(0.04)	-0.03	(0.04)
Second recruitment batch	0.06*	(0.03)	0.05*	(0.03)	0.06*	(0.03)	0.06*	(0.03)	0.06*	(0.03)	0.06*	(0.03)	0.06*	(0.03)
Intercept	1.23***	(0.09)	1.31***	(0.09)	1.11***	(0.09)	1.02***	(0.09)	1.11***	(0.09)	1.22***	(0.09)	1.25***	(0.09)
N	4,571		4,571		4,571		4,571		4,571		4,571		4,571	
R ²	0.73		0.75		0.73		0.73		0.73		0.73		0.73	
Adjusted R ²	0.72		0.74		0.73		0.73		0.73		0.72		0.72	

Notes. *p < 0.05, **p < 0.01, ***p < 0.001. ^a standardized.

general pattern that more exposure yields greater improvement is that we do not find an additional positive relationship for individuals who are currently working.

In Models 2 to 5, we take a closer look at language exposure and investigate whether certain constellations and certain kinds of exposure are particularly relevant to language learning. Model 2 expands on attending language and integration courses by introducing the certificates obtained in these classes. The idea is that individuals who attain a higher qualification experience longer spells of structured learning, which should yield greater improvement. The findings illustrate that this is the case: the higher the certificate obtained, the better the level of self-assessed proficiency.

In addition, the interaction incorporated into Model 3a indicates that the immigrants in our sample who came to Germany with low levels of initial destination-language proficiency profited most from attending language and integration courses. Conversely, individuals who already possess a certain level of German language skills when they arrive do not benefit as much from joining language classes. Model 3b points to a very similar result: a longer duration of stay, which is associated with an increasing exposure to the destination language, is more profitable for individuals who arrive with little knowledge of German, whereas the linguistic gains are smaller for immigrants who enter the host country with better skills.

The interaction recorded in Model 4, moreover, illustrates that different forms of exposure can compensate for each other. That means that, for individuals who regularly speak German with friends, neighbors or colleagues, attending a language course is less important than for immigrants who have less contact with native speakers, and vice versa. Similarly, Model 5a indicates that individuals who are located in the lower part of the cognitive skill distribution benefit more from joining language classes than those at the upper end of the distribution. Taken together, courses which provide a structured environment for acquiring the destination language seem to be particularly important for its acquisition. They can also compensate to some extent for a lack of exposure to the new language in daily contacts, and for lower levels of learning efficiency as captured in the measure of cognitive skills.

Model 5b presents a second interaction between exposure and efficiency. It portrays the reversed notion, namely, that those with greater cognitive skills could be better equipped to make use of the language input available in their environment. The result supports this reasoning. Individuals who achieve higher scores on the cognitive test profit more from talking in German to friends and other people. The differential patterns found in Model 5a and 5b, which both address the interplay of exposure and efficiency, seem to point to a substantive difference between exposure taking place in a structured context, such as a language class, and exposure that is a byproduct of everyday communication. While the former can have a compensatory function supporting especially those with lower cognitive skills, the latter, less structured way of exposure to native speakers, is more profitable for more efficient learners.

5.3 How do Syrian refugees differ from other new immigrants?

Table 4 shifts the focus towards group-specific patterns. Rather than discussing the whole range of findings, in the following, we concentrate on features that set Syrian refugees apart from new immigrants from Italy, Poland, and Turkey. While the variables included in Models 6 to 9 are identical to those of Model 1, in Table 3, Model 10 expands the analyses of Syrians with two additional variables.

To start, we investigate whether Syrians differ from other immigrants regarding the conditions of language learning in terms of incentives. The findings of the multivariate account presented in Table 4, however, are revealed to be rather similar to those reported before, when considering the overall sample (see Model 1 in Table 3). We find that, in most groups, individuals who feel close to Germany achieve greater language improvements, while contrary to our expectations, individuals who intend to stay in the destination country forever do not perform better than those who anticipate leaving at some point in the future.

In Model 10, we additionally take into account the kind of residence permit that Syrian refugees had obtained at the time of the interview. It becomes evident that any legal situation of insecurity is negatively related to language proficiency. Note that it is not possible to include this indicator for Poles and Italians who, as members of the European Union, are free to move and settle anywhere in Europe. For Turkish immigrants, who come from a third country and therefore also need a residence permit, we find a similar, though less pronounced, negative relationship similar to that for Syrians (not shown here).

In a next step, we take a closer look at the set of efficiency variables. Model 9 shows that educational qualifications are strongly connected to German language proficiency among Syrians, but not among any of the other new arrivals (Models 6–8). However, educational qualifications may not always indicate the same level of skills or knowledge across countries. Instead, they need to be evaluated in light of the context in which they were acquired (Spörlein & Kristen, 2019; Spörlein, Kristen, Schmidt, & Welker, 2020). If a certain level of formal education is required for learning a new language, and almost everyone in a population has acquired this basic level of formal education, additional educational qualifications may not provide an extra advantage. If, however, this level has not yet been reached by large parts of a population, we might see an advantage for language acquisition rather in the lower educated-segments.

In Model 10, we further pursue this reasoning by including a measure of literacy in the origin language as an additional feature for Syrians, which may allow setting further apart individuals in the lower spectrum of formal education. On the one hand, the findings indicate that Syrian refugees with rather poor reading and writing skills seem to face particular difficulties when learning German. On the other hand, when taking into account this condition, the coefficients for educational qualifications decrease in size. These findings provide some support for our reasoning, but they do not fully account for the finding that educational qualifications matter particularly for Syrians.

Table 4: Linear regressions of destination-language proficiency according to country of origin

	Italy Model 6		Poland Model 7		Turkey Model 8		Syria Model 9		Syria Model 10	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
German language proficiency t_0	0.39***	(0.02)	0.44***	(0.02)	0.41***	(0.02)	0.08***	(0.02)	0.08***	(0.02)
Incentives										
Intention to stay in Germany (ref. temporary)										
Depends on circumstances	-0.06	(0.05)	-0.05	(0.05)	0.02	(0.05)	-0.03	(0.10)	-0.02	(0.10)
Forever	-0.13*	(0.07)	-0.11	(0.06)	-0.02	(0.06)	-0.10	(0.10)	-0.08	(0.10)
Residence permit (ref. permanent)										
No permit									-0.19	(0.20)
Pending/tolerated									-0.28*	(0.12)
Temporary permit									-0.25*	(0.10)
Closeness to Germany	0.02	(0.02)	0.05**	(0.02)	0.02	(0.02)	0.05*	(0.02)	0.05*	(0.02)
Efficiency										
Age	-0.03***	(0.00)	-0.02***	(0.00)	-0.02***	(0.00)	-0.05***	(0.00)	-0.05***	(0.00)
Cognitive skills ^a	0.04	(0.02)	0.04	(0.02)	0.07**	(0.03)	0.00	(0.03)	-0.01	(0.03)
Education in CO (ref. none/primary/lower secondary)										
Upper secondary	-0.04	(0.09)	-0.06	(0.10)	0.15*	(0.07)	0.30***	(0.05)	0.25***	(0.05)
Tertiary	0.12	(0.09)	0.13	(0.10)	0.06	(0.08)	0.62***	(0.06)	0.56***	(0.06)
Mental health	0.04	(0.03)	-0.01	(0.02)	-0.03	(0.02)	0.03	(0.02)	0.02	(0.02)
CO literacy									0.58***	(0.11)
Exposure										
Duration of stay (in years)	0.40***	(0.08)	0.34***	(0.07)	0.37***	(0.08)	0.28*	(0.13)	0.31*	(0.13)
Duration of stay ²	-0.05**	(0.02)	-0.04*	(0.02)	-0.05**	(0.02)	-0.02	(0.02)	-0.03	(0.02)
Investment in language skills	0.12***	(0.04)	0.01	(0.04)	0.06	(0.04)	0.13***	(0.04)	0.13***	(0.04)
Language/integration course (ref. no)	0.28***	(0.05)	0.25***	(0.04)	0.30***	(0.05)	0.58***	(0.07)	0.56***	(0.07)
In education	0.11*	(0.05)	0.11*	(0.05)	0.07	(0.05)	0.35***	(0.04)	0.33*	(0.04)

Table 4 continued

Table 4 continued

	Italy		Poland		Turkey		Syria		Syria	
	Model 6		Model 7		Model 8		Model 9		Model 10	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
Employed	-0.08	(0.05)	-0.03	(0.04)	-0.11**	(0.04)	0.11**	(0.04)	0.10**	(0.04)
Language use: Partner/children	0.01	(0.02)	0.02	(0.02)	0.04*	(0.02)	0.04*	(0.02)	0.04*	(0.02)
Language use: Friends/other people	0.46***	(0.02)	0.35***	(0.02)	0.29***	(0.02)	0.20***	(0.02)	0.20***	(0.02)
Language use: Media consumption	0.13***	(0.02)	0.07***	(0.02)	0.15***	(0.02)	0.07***	(0.02)	0.08***	(0.02)
Controls										
Female	0.13***	(0.04)	0.14***	(0.04)	0.07	(0.04)	-0.07	(0.04)	-0.09*	(0.04)
Survey mode (ref. face-to-face)										
Online	-0.22	(0.13)	0.20	(0.19)	-0.19	(0.10)	0.05	(0.05)	0.03	(0.05)
Telephone	-0.07	(0.12)	0.25	(0.17)	-0.16	(0.09)	-0.07	(0.05)	-0.09	(0.05)
Second recruitment batch ^b	0.02	(0.05)			-0.03	(0.05)	0.05	(0.04)	0.04	(0.04)
Intercept	0.72***	(0.21)	0.52*	(0.24)	0.97***	(0.20)	1.76***	(0.23)	1.48***	(0.27)
N	1,110		1,107		1,094		1,260		1,260	
R ²	0.83		0.78		0.74		0.53		0.55	
Adjusted R ²	0.83		0.77		0.73		0.52		0.54	

Notes. *p < 0.05, **p < 0.01, ***p < 0.001. ^a standardized. ^b No second recruitment batch for Polish immigrants.

For other indicators of efficiency, the results reveal rather similar patterns to those observed in the pooled sample. As numerous previous empirical studies have found (e.g., Chiswick & Miller, 1995; 2001; Espenshade & Fu, 1997; Stevens, 1999), age is negatively related to language proficiency. Contrary to our expectations, we do not encounter a health-related disadvantage for any group, including Syrian refugees.

Finally, the results on exposure reflect those obtained for the pooled sample: the different immigrant groups, by and large, respond rather similarly to the conditions captured by the various indicators. Probably the most important observation in this context is that Syrian refugees seem to profit more than other groups from certain kinds of exposure, such as from attending language courses, from pursuing further education, and from working. Given that upon arrival, many Syrians hardly knew any German, their continued exposure to structured learning environments, such as those encountered in educational institutions or language courses, seems to have paid off. This assessment is also reflected in the descriptive findings presented in Table 2. They illustrate that with 92 percent Syrian refugees were more likely to attend a language or integration course than individuals from any other group (i.e., 70 percent among Italian immigrants, 68 percent among Polish immigrants, and 81 percent among Turkish immigrants) and that, in these classes, larger shares than in all other groups achieved at least an intermediate certificate (i.e., 70 percent of Syrian refugees at achieved at least B1, versus 36 percent of Italian immigrants, 30 percent of Polish immigrants, and 39 percent of Turkish immigrants).

Overall, the set of variables that we considered to capture the three constructs of the general model of language learning account for large parts of the variance in language development. R^2 , however, turns out to be smaller for Syrian refugees than it does for the other immigrant groups. This is at least partly linked with the fact that most Syrians arrived in Germany without any knowledge of German, while in the remaining groups, destination-language proficiency was more dispersed, with many having acquired at least some skills (see Table 2 and Figure 1). In other words, compared to other recent immigrants, Syrians were concentrated at the lower end of the linguistic skill distribution, and thus showed less variance in their initial levels of proficiency. Therefore, considering initial language skills in the regression models produces a considerable increase in R^2 for all groups, except for Syrian refugees.

6. Conclusions

This contribution addressed immigrants' destination-language acquisition in the early period after arrival. In addition to describing patterns of linguistic fluency, we focused on a range of conditions relevant for learning a new language. Based on Chiswick and Miller's (1995; 2001) well-established model of language acquisition, according to which language fluency is a function of exposure, efficiency, and in-

centives, we discussed a selection of these conditions. We then applied the reasoning to different groups of contemporary immigrants and contrasted Syrian refugees with individuals from Italy, Poland and Turkey. In the following, we highlight and discuss the main findings.

First, most individuals improve their proficiency over time. The results point to a steeper learning curve among Syrians compared to other groups of new immigrants. Part of this difference seems to be attributable to the fact that most Syrian refugees arrived without any prior knowledge of German and that those learning a new language from scratch tend to experience faster initial improvements (Hartshorne, Tenenbaum, & Pinker, 2018). However, considering that the initial measurement of linguistic skills at the time of entry (t_0) was assessed in hindsight at the time of the first interview (t_1), it may be preferable to first ensure that a differential pattern is indeed present before further speculating about its origins. It will be possible to provide a more appropriate description of the developments of destination-language skills once the second wave of the ENTRA survey is completed. This second data collection, in which respondents will report on their skills based on the same measurement as in the first interview, will allow new immigrants' gains in proficiency to be assessed over time and for possible differential learning pathways to be identified across different groups of recent immigrants.

Second, our multivariate results in largely reflect the findings of previous studies. This assessment applies to all three dimensions of the model of language acquisition. Our analyses point to the relevance of a range of established indicators signaling efficiency and, above all, exposure. Regarding incentives, the empirical evidence turned out to be less consistent and partly divergent from the theoretical expectations. It should be kept in mind, however, that inconsistencies and contradictory findings are typical for empirical studies that consider incentives (for a summary of this evidence see Kristen, 2019, p. 525).

Third, regarding the relative importance of the three dimensions of language learning, our empirical analyses attest to the central relevance of exposure to the dominant language compared to conditions that signal efficiency and incentives. This finding is in line with a large body of results which illustrate that exposure is the major source of destination-language proficiency (e.g., Braun, 2010; Chiswick & Miller, 1995; 2001; Espenshade & Fu, 1997; Kristen et al., 2016; Stevens, 1999; van Tubergen & Kalmijn, 2005).

Fourth, considering the significance of new language exposure, we analyzed different kinds of exposure and distinguished between structured input taking place in language courses or within educational institutions, and everyday communication via contact with native speakers. The evidence attests to the crucial importance of both. However, our findings also indicate that, for immigrants who arrive with minimal or without any prior knowledge of German, or who are located in the lower parts of the cognitive skill distribution, attending language classes can be especially profitable. Consequently, providing new immigrants with opportunities for language instruction seems to be a promising way of supporting especial-

ly those individuals who are less privileged in terms of their learning resources endowments.

Fifth, as initially proposed, the results clearly support the assumption that language learning is a process that follows a general logic (Kristen et al., 2016, p. 203). Given similar conditions and experiences, individuals attain similar levels of proficiency, no matter where they originate from or for what reasons they leave their home country.

Sixth, we argued that group-specific patterns can nevertheless occur because Syrian refugees may have encountered certain kinds of situations or conditions more frequently than Italian, Polish or Turkish new immigrants. Along these lines, our analyses revealed that an insecure legal status, which is more common among Syrians, is negatively associated with language acquisition. Considering that, as contemporary refugees, Syrians are more likely to have experienced violent conflict as well as danger on their journey to Europe, we expected them to more commonly experience mental health problems and for their language acquisition to suffer as a consequence. The empirical findings, however, did not confirm either phenomenon. While other data sources mostly point to a higher prevalence of mental health issues among recent refugees, and therefore differ from the distributions presented here (Brücker, Rother, & Schupp, 2016, p. 86), studies that examine the relationship between mental health and language learning are rare and provide inconclusive evidence (e.g., van Tubergen, 2010).

Seventh, and contrary to our expectations, the results also pointed to seemingly differential relationships between certain conditions and language proficiency across groups. On the one hand, the results revealed that it is only among Syrian refugees that educational qualifications acquired in the country of origin are associated with German-language skills, while this relationship was largely absent in the other groups. On the other hand, Syrians profited more than other new arrivals from increased levels of exposure to the new language, including attending language classes, pursuing further education, and working. Especially at low levels of initial proficiency, immediate and sustained exposure to structured learning environments seems to be a promising route to language acquisition.

So far, we were only able to analyze the first wave of the ENTRA survey. Only after the completion of the second data collection, will it be possible to clarify whether the observed differential relationships with proficiency that seem to set Syrian refugees apart from Italian, Polish and Turkish immigrants, also manifest longitudinally. The longitudinal perspective is also crucial for moving away from mere descriptions of associations to tackling the causal relationships that are proposed by the model of language acquisition. This also includes addressing reciprocal relations. For example, in our study the relationship between employment and language skills could go in both directions. On the one hand, a certain level of proficiency is required for entering the labor market, and those with better skills are more likely to be employed. On the other hand, employment may provide exposure to the destination language, and therefore contributes to improving language skills further.

Another limitation concerns the dependent variable, which was based on respondents' self-assessed proficiency. Research shows that these reports do not fully match actual skills as measured by standardized tests, and that they can be, to some extent, biased (Edele, Seuring, Kristen, & Stanat, 2015). The situation in our case might be further complicated by the fact that the groups under study differ in proficiency levels. If the extent of the bias were connected to certain skill levels, this would affect our analyses. For example, Syrian refugees mostly arrived with absent or very low levels of initial German-language proficiency, while the remaining immigrant groups show a greater degree of dispersion in language fluency upon entry. If a certain kind of bias is typical for individuals who start learning a new language (e.g., that they perceive their progress to be greater than it actually is), this could lead to group differences, such as the steeper learning curve observed for Syrian refugees. This limitation seems particularly relevant for descriptive analyses of the development of language skills over time and across immigrant groups. It should be, however, less problematic for our multivariate analyses, in which we account for initial levels of destination-language proficiency and for other factors that might introduce bias such as cognitive skills. Moreover, we calculated separate regression models for each immigrant group. These analyses should not be affected by potential group-specific bias.

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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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Keywords

Refugees; Educational resources; Structural integration; Labor market integration; Germany

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.

Schlagworte

Flüchtlinge; Bildungsressourcen; Strukturelle Integration; Arbeitsmarktintegration; Deutschland

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 adaptations” (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 extent 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 multi-stage 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

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	<i>n</i>	%	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.

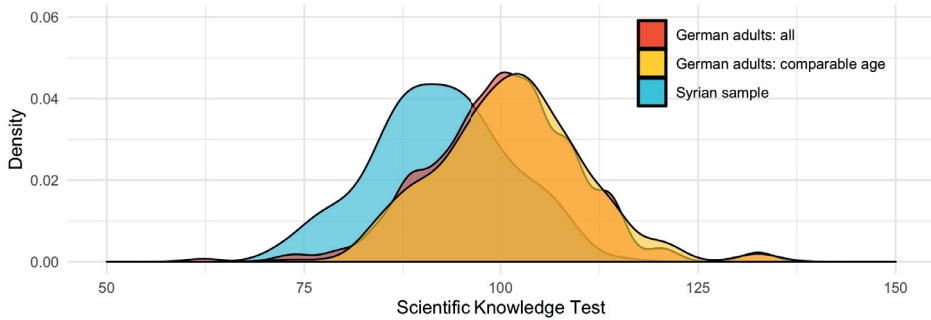
Table 1 further suggests gender and age differences with regard to educational degrees. Women were apparently overrepresented in the groups with no or low educational degrees and underrepresented in the more educated groups. However, these differences are not statistically significant (Pearson $\chi^2(5) = 9.28$, $p = 0.10$; 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

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

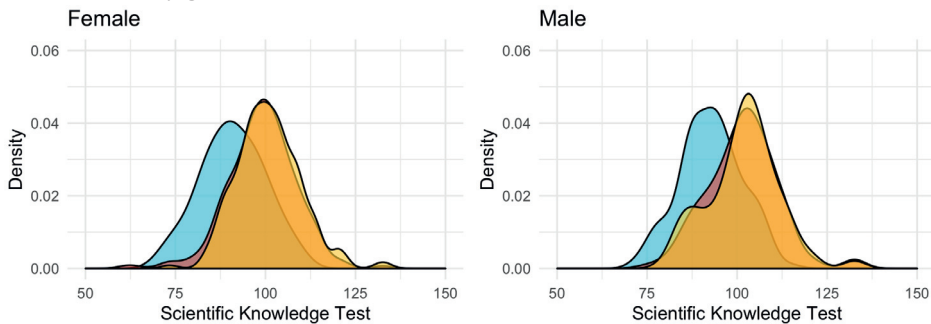


Figure 1. Syrian sample aged 18 to 58 with a mean age of 30.3 years, $n = 205$ (non-imputed data); German sample of comparable age: aged 18 to 43 with a mean age of 30.6 years, $n = 319$; German sample: aged 18 to 93 with a mean age of 53.3 years, $n = 1,063$.

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	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
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).

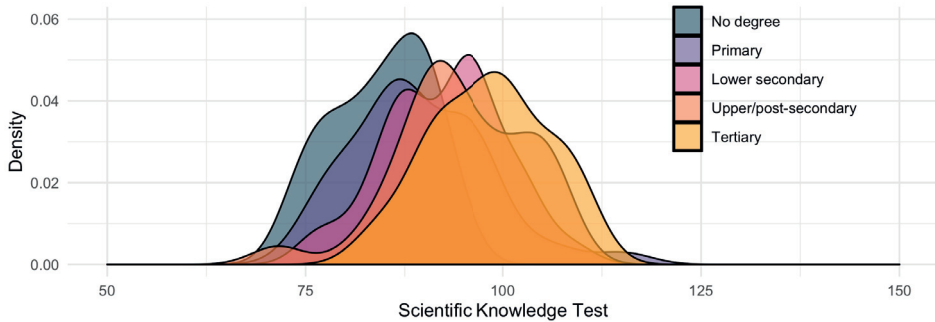
Next, we investigated how the scientific knowledge test scores correspond with the respective Syrian educational degrees. Figure 2a presents a clear sequence of increasingly higher levels of declarative knowledge with degree levels (for means and standard deviations, see Table 2).⁴ However, the distributions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

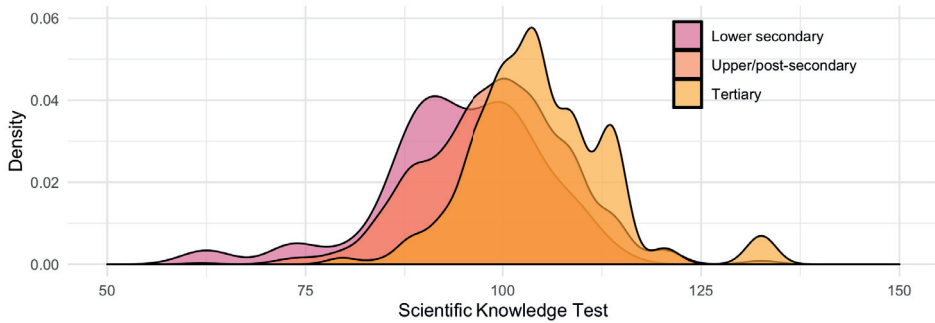
4 In additional analyses we compared those studying at a higher level without completion to those who had not. The differences within degree levels are less than 2 points and not significant.

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

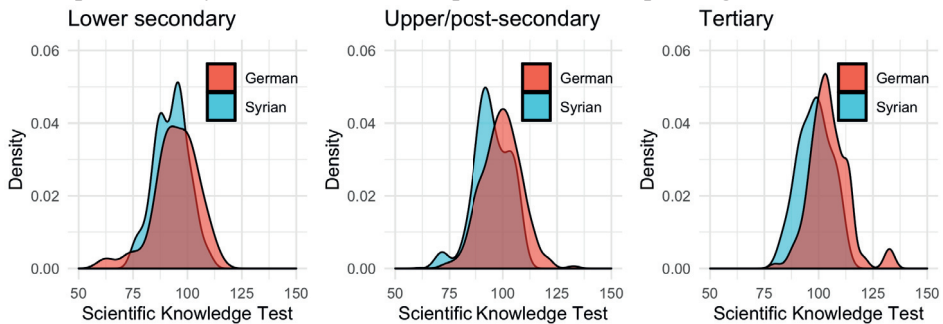


Figure 2. Panel a. non-imputed Syrian sample ($n = 205$, QPLC data). *Panel b.* German sample, $n = 1,063$; “Lower secondary” refers to persons with a lower secondary degree (*Hauptschulabschluss* or *Realschulabschluss*) and with no vocational or tertiary degree ($n = 111$, 10.4%); “upper/postsecondary” 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 post-secondary 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 market 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.

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** (0.035)	0.045 (0.039)	0.031 (0.036)	0.008 (0.038)
Lower secondary	0.052 (0.044)	0.005 (0.052)	0.032 (0.053)	-0.003 (0.058)
Upper/postsecondary	0.034 (0.050)	-0.023 (0.066)	0.019 (0.047)	-0.027 (0.063)
Tertiary	0.207** (0.097)	0.132 (0.107)	0.163* (0.089)	0.108 (0.098)
Education interrupted	0.026 (0.047)	0.029 (0.047)	0.027 (0.045)	0.026 (0.045)
Science knowledge test		0.005** (0.002)		0.004* (0.002)
Female			-0.040 (0.045)	-0.039 (0.043)
Age at arrival in Germany			0.001 (0.002)	0.001 (0.002)
Child(ren) in DE: 1 or more			-0.016 (0.043)	-0.017 (0.044)
Duration of stay in Germany (years)			0.012 (0.025)	0.014 (0.025)
German language skills (Interviewer assessments)			0.009 (0.014)	0.004 (0.014)
Residence status (Ref.: other)				
Subsidiary protection			0.013 (0.052)	0.031 (0.052)
Full refugee/asylum status			0.050 (0.061)	0.065 (0.062)
Health (Self-assessed)			0.027 (0.017)	0.021 (0.016)
Intention to stay (Ref.: Uncertain)				
Short-term			0.116** (0.045)	0.106** (0.042)
Long-term			0.016 (0.044)	0.014 (0.045)
Constant	0.016 (0.055)	-0.400** (0.181)	-0.170 (0.109)	-0.480** (0.184)
<i>n</i>	263	263	263	263
<i>R</i> ²	4.18	6.19	9.38	10.60
Adjusted <i>R</i> ²	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 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 market 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.

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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				
	<i>M</i>	<i>M</i>	<i>SD</i>	<i>Min.</i>	<i>Max.</i>	<i>n</i>
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 (Inter- viewer 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. $n_{\text{imputed}} = 263$.

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Wissensmobilisierung und Transfer in der Fluchtforschung

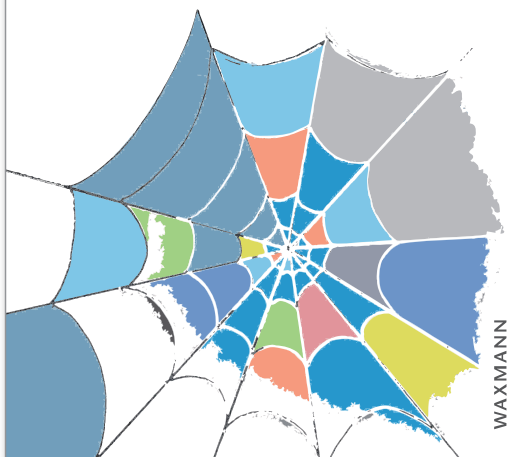
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