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# DISCUSSION PAPER

// LUDOVICA GAMBARO, GUIDO NEIDHÖFER,  
AND C. KATHARINA SPIESS

## The Effect of Early Childhood Education and Care Services on the Social Integration of Refugee Families

# The effect of early childhood education and care services on the social integration of refugee families

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**Abstract:** Devising appropriate policy measures for the integration of refugees is high on the agenda of many governments. This paper focuses on the social integration of families seeking asylum in Germany between 2013 and 2016. Exploiting regional differences in early childhood education and care (ECEC) services as an exogenous source of variation, and controlling for local level heterogeneity that could drive the results, we estimate the effect of ECEC attendance by refugee children on their parents' integration. We find a significant and substantial positive effect, in particular on the social integration of mothers. The size of the estimate is on average around 52% and is particularly strong for improved language proficiency and employment prospects.

**JEL Codes:** I26, J13, J15.

**Keywords:** asylum seekers, refugees, childcare, early education, integration

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# 1 Introduction

The number of refugees living in European countries increased dramatically in the mid-2010s, with EU countries receiving almost five million asylum applications between 2013 and 2018 (Eurostat 2019). In Germany alone, close to one million refugees entered the country in the second half of 2015 (BAMF 2016). This influx has had important repercussions on public policy. Measures were implemented to, first, provide humanitarian assistance to the refugees and, then, to integrate them into the host countries.

Using data from Germany, this study focuses on early childhood education and care (ECEC) as a potential factor contributing to the social integration of refugee families. ECEC has the potential to reach many refugee families, since they often have children of ECEC age. Indeed approximately 144,000 refugee children under the age of seven arrived in Germany with their families between January 2014 and December 2017.<sup>1</sup> Moreover, refugee women tend to display high fertility soon after arrival, making the provision of ECEC of particular relevance for them (Liebig and Tronstad 2018).

There is wide consensus that ECEC services can help the acquisition of the host-country language among migrant children whose first language is different. Indeed, research has documented positive effects of ECEC on children's outcomes, suggesting that migrant children stand to gain disproportionately from early education attendance (among others, Bleakley and Chin 2008; Cornelissen et al. 2018; Drange and Telle 2015; Felfe and Lalive 2018).<sup>2</sup> By contrast, relatively little attention has been dedicated to the specific benefits ECEC may provide to migrant *parents*. One exception is the study of Norway by Drange and Telle (2015), who however find no effects of immigrant children's increasing ECEC attendance on their parents' integration, measured by employment and education. In this paper

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<sup>1</sup> Destatis (2019) reports number of asylum applicants under the age of 18 for all the years 2007 to 2018. The figure on refugee children under the age of 7 reported here was obtained upon specific request to the Federal Statistical Office of Germany (*Statistisches Bundesamt*).

<sup>2</sup> For a meta-analysis on the topic see van Huizen and Plantenga (2018).

we contribute to this emerging literature and investigate the unique position of refugee parents and the role of ECEC provision on their integration.

Refugees are a particularly vulnerable group of migrants. Especially in the first years after arrival, they typically have worse health, poorer language skills, and much lower employment rates than other migrant groups with otherwise similar characteristics (Dustmann et al. 2017; Fasani et al. 2018). In addition, dispersal policies, which apply to refugees but not to migrants, can make refugees feel socially isolated (Fasani et al. 2018). Therefore, we hypothesize that adult refugees are likely to benefit from their children’s participation in ECEC in several ways. First, they are likely to profit from the social contacts that ECEC participation potentially brings. Regular interactions with ECEC staff and other parents are likely to give refugees the opportunity to practice the host country language and foster job search networks (Dustmann et al. 2017; OECD 2016). Indeed, most surveyed refugees who have recently arrived in Germany and are employed report having found their job through social contacts (Eisnecker and Schacht 2016). Second, parents whose children are enrolled in ECEC may feel compelled to become involved with the culture of the host country, because they see their children learning the language, celebrating local traditions, and possibly developing a sense of belonging to a host-country community setting such as an ECEC center (Dustmann 1996; Avitabile et al. 2013). Third, as with all parents, ECEC services relieve refugees, especially mothers, from child care duties, freeing up time to participate in employment or training courses as well as to actively engage in the integration process (Jessen et al. 2020).

To estimate the impact of ECEC attendance by refugee children on the social integration of their parents we have the advantage of drawing on a large new survey, providing data from a nationally representative sample of refugees who applied for asylum in Germany between 2013 and 2016. This dataset includes a rich set of information on pre- and post-migration characteristics of the respondents and of their family members, including children. Using geographical identifiers, we link this survey data to administrative information on the economic and institutional characteristics of the jurisdiction where survey respondents live.

We further augment our data with administrative data on local ECEC services, capturing variation across lower administrative levels (counties) within states.

Our estimation strategy exploits the fact that refugees arriving in Germany are randomly dispersed, first across federal states and then within states to ensure an even distribution throughout the country. As a consequence of this dispersal policy, the communities where refugees live differ greatly along several dimensions, including the availability and features of ECEC services. Similar to several studies before (Bach et al. 2019; Bauernschuster and Schlotter 2015; Cornelissen et al. 2018; Felfe and Lalive 2014; Kühnle and Oberfichtner 2017), our estimation strategy exploits geographical differences in ECEC services as exogenous source of variation in attendance. By using a factor-based instrumental variable (IV) approach we avoid bias from selection into ECEC and we are able to offer the first estimates that support a causal interpretation of the association between refugee children's participation in ECEC and the social integration of their parents.

A further contribution of our study is that social integration is measured in a novel way. Through a principal component analysis we construct an index of social integration, which combines the information contained in twelve survey items, comprising language proficiency, social inclusion, training, and actual and perceived employment prospects. Our results show that ECEC participation of refugee children substantially affects the social integration of their mothers, while we do not find any sizeable effect for fathers. On average, the conditional difference in social integration between parents whose children attend ECEC and those who do not is around 40%. The IV estimate shows that the social integration boost given by ECEC enrolment for mothers is about 80%, which is equivalent to living in Germany for more than six years. Disentangling the different dimensions of social integration, we show that the effects are particularly strong for self-assessed language proficiency and the perceived probability of future employment in Germany.

We extensively test the validity of our instrument and the robustness of our results. In particular, we control for the average social integration of refugees without children or with children attending school, whose integration depends on

the overall suitability of the local context but not on ECEC provision. We further run a placebo test of the effect of our instrument on the social integration of refugees without children or with children of school age only and show that it does not have a significant relationship with their social integration. Finally, we exploit the longitudinal nature of the survey and estimate a model including individual fixed effects on the sample of families that participated in two survey waves. The panel results confirm that ECEC enrolment of refugee children has a positive and significant effect on the integration of their mothers and no effect on the integration of their fathers.

Our results provide new evidence on the integration of refugee families in European countries. In particular, they show how ECEC services hold the potential to support the integration of not only, as conventionally assumed, refugee children, but of their parents too. Our findings also call for greater attention to the distinct circumstances of refugee mothers relative to their male counterparts.

## 2 Institutional Background

ECEC in Germany is provided through a universal and strongly subsidized system, almost exclusively operated by the local administration and non-profit organizations (Spiess 2008). Since 1996, children have been legally entitled to a place in an ECEC center from the age of three until they enter primary school, usually when they turn six. In 2013, a similar legal right to an ECEC place was extended to children aged one and two. As a result, in 2015, 33% of children under three and 95% of children aged three and above attended formal ECEC services (Statistische Ämter des Bundes und der Länder 2015).

There are marked differences in attendance rates across regions, most notably between Eastern and Western states, but also across lower administrative jurisdictions within the same state, to which we refer to as ‘counties’ (see Figure S1 in Supplemental Material).<sup>3</sup> Indeed, while the federal government retains

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<sup>3</sup> This administrative level consists of counties (*Kreise*) made of different smaller municipalities and of larger cities independent of counties (*kreisfreie Städte*). As for 2020, there are 401 of such administrative units, which vary in size and population.

legislative authority, the actual responsibility for funding, regulating, and providing ECEC services lies with states and counties, resulting in substantial geographical variations in the number of places available, admission criteria, fees charged, and quality regulation such as children-to-caregiver ratios (Spiess et al. 2008; see also Figure S1 in Supplemental Material). Fees tend to be low and are typically determined by family income and the number of children in care (Schmitz et al. 2017). Yet the exact fees scales and waivers for specific groups vary locally. Apart from large regional differences, there are disparities in ECEC attendance by socio-economics background, with children from families where both parents are immigrant and those from families with relatively low levels of education much less likely to attend ECEC than their peers from native and more advantaged families (Jessen et al. 2020).

Within this framework of highly decentralized ECEC governance, it is not surprising that federal states have also developed different approaches in relation to refugee children's participation in ECEC. While some states allowed refugee children to enroll in ECEC as soon as they leave the initial reception center, others granted access only after they moved into private accommodation, once their asylum application is approved, or after a "tolerated stay permit" (known as *Duldung*) is issued (Deutsches Institut für Menschenrechte 2017).<sup>4</sup> At a more local level, there appears to be even greater variability in individual ECEC centers' capacity to cater for refugee children (Scholz 2017).

To avoid refugees settling mainly in border regions and large cities, Germany operates a dispersion policy whereby refugees are distributed across federal states according to a proportionality formula (known as *Königsteiner Key*) based on each states' population and tax revenues. Within each state, refugees are further dispersed across counties, whereby more populous ones receive more refugees. Some states apply some further smaller adjustments, for example by accounting

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<sup>4</sup> The "Tolerated Stay Permit" or "Toleration Status" (*Duldung*) is issued to individuals who are, in principle, obliged to leave the country, but whose departure is temporarily not feasible because of, for example, family or medical reasons (§ 60a Asylum Act). This type of permit enables individuals to legally live in Germany and, although designed to be a temporary measure, can be renewed and lead to the attainment of a residence permit in many cases (European Commission 2013).



for unemployment and/or housing costs. German dispersal mechanism aims at distributing costs fairly across all local administrations, in contrast to those of other countries such as the United States or Australia, where the allocation to specific communities depends on reception capacity rather than equalizing factors, or to more complex formulas that seek to match refugees' characteristics to those of local labor markets, as in Sweden or the Netherlands (OECD 2018). In Germany, while their application is being processed, refugees are obliged to reside in their allocated area. Once they have been granted protection, refugees are still not permitted to move to other states or counties within their state, albeit such restrictions apply differently across states and over time (Schikora 2019). As a result, there exist considerable differences in the characteristics of the areas where the refugee population live, including differences in the availability and characteristics of ECEC. As we explain next, our empirical strategy exploits this combination of large local variations in ECEC services and, from the perspective of refugees, their random distribution across counties.

### **3 Empirical Strategy**

The aim of this study is to test whether ECEC attendance by refugee children significantly contributes to the social integration of their parents. Yet it is difficult to derive estimates of the impact of ECEC that can be interpreted causally given that variation in attendance is likely to be driven by factors also affecting integration. For example, families with higher education levels or stronger willingness to assimilate in the host country's society might be more keen to enroll their children in ECEC. Likewise, areas that are more suitable to the integration of humanitarian migrants might also have more accessible ECEC services, biasing upward the association of ECEC attendance with social integration.

To account for these potential sources of bias, we first run a model including a rich set of covariates to control for the pre- and post-migration characteristics of individuals and their families, as well as of the county in which they are residing in Germany. Then, we instrument our main variable of interest, namely ECEC

attendance of a child in the household, to estimate the causal effect of ECEC attendance of children on the social integration of their parents.

Our empirical strategy is illustrated as follows:

$$s_{jmk}^* = \alpha_1 + \beta c_{mk} + \gamma_1 X_{jmk} + \delta_1 F_{mk} + \psi_1 I_k + \epsilon_{jmk} \quad (1)$$

$s_{jmk}$  is the social integration of refugee  $j$  from household  $m$  residing in county  $k$ . In the next section, we explain how we measure this level of social integration for each individual. The variable  $c$  measures the ECEC attendance of children in  $m$ , either measured by a dummy or by the actual number (or the share) of children in the household enrolled in ECEC.  $X$  and  $F$  are vectors containing covariates that vary at the individual and family level, respectively.  $\epsilon$  is the error term.

The main coefficient of interest is  $\beta$ . The inclusion of federal-state fixed effects and county characteristics ( $I$ ) ensures that the magnitude and sign of this coefficient are not driven by factors related to the institutional environment surrounding refugees. In some specifications we include county fixed effects, removing all heterogeneity due to county characteristics. This corrects for possible bias arising from the fact that some counties might seek to offer ECEC to refugee children while, for instance, also actively creating a more welcoming environment for all refugees.

If the selection effect is entirely driven by the observable characteristics included in equation (1),  $\beta$  captures the effect of ECEC attendance of children on the social integration of their parents. However, as mentioned above, it is plausible to assume that unobservable individual characteristics of the parents drive the association as well, for example parents' willingness to integrate. To account for these confounders our estimation strategy exploits local differences in ECEC supply characteristics as an exogenous source of variation (for similar but not identical approaches see Bach et al. 2019; Bauernschuster and Schlotter 2015; Conerlissen et al. 2018; Felfe and Lalive 2018; Kühne and Oberfichtner 2017). This geographical variation, together with the random allocation of recent refugees,

first to federal states and then to counties, creates a quasi-experimental set-up that can support causal inference.

We pursue an instrumental variable strategy. An intuitive instrument for  $c$  would be the availability of ECEC for refugee children in the place where the family was allocated. However, this measure is unobserved. Instead, information exists on the characteristics of ECEC services at county level, including the number of supplied slots per child, children-to-caregiver ratios, or maximum group sizes, that are arguably factors underpinning ECEC centers capacity to enroll refugee children. We apply a factor-based instrumental variable approach that is particularly suitable when multiple variables are available as instruments and remain consistent even if some (or all of them) are only weakly correlated with the endogenous variable that must be instrumented (Bai and Ng 2010; Kapetanios and Marcellino 2010; Kapetanios et al. 2015). The method assumes that the optimal instrument is latent and unobservable, but multiple variables that are driven by common factors are available to approximate it. Remaining agnostic about which combination and functional form of these variables explain the variance in the endogenous regressor, the method provides a stepwise empirical procedure to exploit all available information. The steps of the procedure we apply are: First, among the set of possible proxies, a subset is chosen following selection criteria; namely statistical significance of the bivariate association between the potential instrument and the endogenous regressor (in our case: whether a child in the household attends ECEC). Then, a principal component analysis on this subset of variables is run to reduce the information given by the combination of these variables into a score for the county-level supply of ECEC. Finally, the resulting first component is used as an instrument. Applying this information reduction procedure is shown to provide more efficient estimates than using the observed variables as instruments (Bai and Ng 2010). In addition, it avoids losing degrees of freedom, which would be triggered by the simultaneous inclusion of all variables in the first stage regression.

Following this procedure, we adopt a two-stage least square approach (2SLS), summarized in the next two equations. In the first stage, ECEC attendance of the child is regressed on the instrument  $\bar{c}$ , namely the county-level ECEC supply score:

$$c_{mk} = \alpha_2 + \eta\bar{c}_k + \gamma_2 X_{mk} + \delta_2 F_{mk} + \psi_2 I_k + u_{jmk} \quad (2)$$

This county-level ECEC supply score is obtained by a principal component analysis of the median children-to-caregiver ratios for different age groups (specifically: infant and toddlers groups, groups with children aged zero to four, and mixed-age groups including children from birth to six), as well as the ECEC attendance rates for children under three, and from three to six.<sup>5</sup> The coefficient  $\eta$  shows the relevance of  $\bar{c}$  for predicting the individual child care attendance of refugee children. Control variables are defined as above.

In the second stage, we use the predicted values from equation (2) to obtain the 2SLS estimates of ECEC attendance of children on the social integration of parents:

$$s_{jmk}^* = \alpha_3 + \theta\hat{c}_{mk} + \gamma_3 X_{jmk} + \delta_3 F_{mk} + \psi_3 I_k + v_{jmk} \quad (3)$$

The inclusion of the county-level control variables is crucial for ensuring that our instrument meets, in the terminology of IV estimation, the exclusion restriction, ruling out that the county-level ECEC supply score captures the effect of better overall opportunities for social integration rather than being only a proxy for local childcare opportunities. Since the level of variation of our instrument is at the county level, we cannot control for county-level heterogeneity by fixed effects. To

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<sup>5</sup> Supplemental Figure S2 shows the local variation and density of the instrument (ECEC supply score). The components loadings are reported in Supplemental Table S1. As suggested by Ng and Bai (2009), additional variables were originally considered but ultimately discarded from the principal component analysis because they had low statistical power to predict  $c$  in the bivariate regressions. These excluded variables were: the county-level children-to-caregiver ratios for the age groups 3-6 and 2-6 and the county-level ECEC supply rates for full-time provision only. Including them in the construction of the instrument reduces the significance of the first stage, but does not affect substantially the effect size obtained in the second stage. The inclusion of all variables used to construct the ECEC supply score in the first stage regression does not alter the size of the estimates, just their precision, as shown in the Supplemental Table S3. It should be also noted that ECEC provision in Germany is rationed and thus attendance rates coincide with ECEC supply rates (see also Jessen et al., 2020).

control for all potential sources of omitted variable bias, among the set of county-level covariates, we include the average social integration of all refugees living in county  $k$  but who do not have children or have children older than 6, who therefore attend school rather than ECEC. We estimate these two average measures at the county level using our data. The level of integration of these two groups captures how conducive to integration the local context is for people who do not benefit from ECEC.

With the instrument predicting the social integration of refugees only through its correlation with ECEC attendance, the coefficient  $\theta$  yields the local average treatment effect for refugee parents whose children attend ECEC. To ensure that the exclusion restriction holds, we also perform several additional estimations, as well as placebo tests on the relationship between the ECEC supply score and the social integration of refugees without children from birth to six years of age. We discuss these after presenting our main results in subsection 5.6.

## **4 Data and Measurement**

### **4.1 IAB-BAMF-SOEP Survey of Refugees**

The primary data source for our study is the IAB-BAMF-SOEP Survey of Refugees in Germany (Brücker et al. 2016; Kühne et al. 2019). This innovative longitudinal survey is conducted by the Institute for Employment Research of the Federal Employment Agency, the Research Centre on Migration, Integration, and Asylum of the Federal Office of Migration and Refugees, and the Socio-Economic Panel at DIW Berlin. The survey is representative of the population of refugees and asylum seekers who arrived in Germany between 2013 and 2016 and were registered in the Central Register of Foreigners by January 2017. Fieldwork for the first wave was carried out in 2016. In 2017, around 1,500 additional households were added to the sample. A total of approximately 6,700 adults from 4,800 households have been interviewed, with information on children collected from the main adult respondent. The survey was a computer-assisted face-to-face survey using audio files in seven different languages: Arabic, English, German, Kurdish Kurmanji, Pashto, Persian and Urdu (Kühne et al. 2019).

Our sample for this analysis comprises only parents living with children younger than seven<sup>6</sup> for whom the adult responding to the household questionnaire reported information on ECEC attendance. Because of the differential access rules to ECEC among federal states explained above, we restrict our attention to respondents whose application process is completed, including those with “tolerated status” and drop respondents whose asylum application is still pending.<sup>7</sup> The final sample comprises only observations with complete information on outcomes and control variables available. These are 1,178 parents, nested in 821 different households. In 355 of these households both parents (710 individuals) answered the personal questionnaire including questions about their integration whereas in 400 households only one of the two parents, in around 60% of cases the father, participated in the survey. In 65 additional cases the household was made of one parent only, invariably the mother. Finally, in one case the household included a couple with young children and a single mother with one child.

**[Table 1 about here]**

Table 1 reports the descriptive statistics. In the data, 55% of all refugee parents of children in the age group zero to six have at least one child attending ECEC. Respondents’ average level of education is relatively low compared to the average in Germany). Almost 40% have no schooling degree, only one-fourth has a good knowledge of English, and very few spoke some German before migrating. However, most are healthy, and report high levels of self-esteem and resilience. More than half of the sample is from Syria.

Additional analysis show that older refugee children are more likely to attend ECEC centers than younger ones, and that there are strong state variations in attendance among both age groups (see Figure S3 in Supplemental Material).

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<sup>6</sup> We excluded children enrolled in primary school among the six-year-olds.

<sup>7</sup> Including them lowers slightly the effect size, but does not alter the general pattern of the results.

## 4.2 County-level data

The IAB-BAMF-SOEP dataset includes geographical identifiers for the county where respondents live. Refugees interviewed by the survey live in 244 of the 401 German counties, with at least one refugee child under six living in 228 of them. As we formally demonstrate later, families with young children are dispersed in the same counties as other refugee families (see also Figure S4 in Supplemental Material).

We use the county-identifier to link variables measured at the county level from the INKAR data set provided by the German Federal Institute for Building, Urban Affairs and Spatial Research. INKAR regularly provides statistical information on topics such as labor market, education, demography, income, public finances, and the environment at different geographical levels, including counties. From INKAR data, we also retrieve information on ECEC attendance rates at the county level. We complement this with information on ECEC provision, retrieved from the “Early-Childhood-Education-Monitor”, which presents ECEC indicators based on administrative records on all ECEC centers in Germany as collected by the statistical offices of each German state (see also Autorengruppe Bildungsberichterstattung 2018).<sup>8</sup>

## 4.3 Measurement of Social Integration

Our main outcome measure is the level of integration of refugees. Although integration is recognized as a multi-dimensional process spanning economic, social, and cultural domains, much attention has been paid, especially in the economic literature, to the labor market, often using refugees’ employment status or earnings as indicators of integration. Yet a focus on labor market outcomes is not suitable for capturing the level of integration of a population of refugees which has just arrived in the host country. Among respondents in our sample, who at the

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<sup>8</sup> The internet portal <https://www.laendermonitor.de/de/startseite> operated by the Bertelsmann Foundation provides rich statistical information on the ECEC in Germany. The data used here are based on elaborations by the Bertelsmann Foundation and the DJI/TU Dortmund on the administrative data series “Statistisches Bundesamt: Kinder und tätige Personen in Tageseinrichtungen und in öffentlich geförderter Kindertagespflege”, collected annually by the statistical offices of the 16 German states.

time of the interview had been living in Germany an average of just 18 months, only 8 percent of men and less than 1.5 percent of women were employed.

Therefore, we construct an indicator capturing current integration and the prospects of integration in Germany that combines indicators of labor market integration with indicators of cultural and social integration. These dimensions of integration have been investigated in their own right (for examples on Germany, see Avitabile et al. 2013; Danzer and Yaman 2013; Dustmann 1996) and have also been shown to lead to better economic outcomes. Specifically, there is extensive evidence pointing to the crucial role of proficiency in the host country language for integration. Dustmann (1994) and Dustmann and Van Soest (2002) show that fluency in German, both written and spoken, are major positive determinants of immigrants' earnings. There is also research showing that immigrants benefit from social interactions with natives. Drever and Hoffmeister (2008) and Kanas et al. (2012) provide evidence that immigrants' contact with native Germans results in favorable job changes or occupations with higher prestige respectively.

We use survey items that are suitable for capturing individuals' integration and potential for integration across different domains. More specifically, we use current employment status and the subjectively evaluated probability of future employment in Germany to capture integration prospects in the labor market. These are combined with an item on participation, past or current, in a language, integration or orientation course to measure engagement in education and training as a proxy for investment in the host-country's specific human capital. Knowledge of the German language is measured by four items. Three are self-reported, allowing us to differentiate between speaking, reading, and writing abilities, which have been shown to have differential impact on labor market outcomes (Dustmann 1994; Dustmann and Van Soest 2002). A fourth item reports the interviewer's assessment of respondent's proficiency, partly correcting for the upward measurement error bias in respondents' self-classification (Dustmann and Van Soest 2001). The last group of items relate to the social inclusion of refugees: the number of German acquaintances as well as indicators of whether the respondent



misses the company of others; feels excluded; feels socially isolated; or misses people from their home country.

To combine these items, we perform a principal component analysis and create an index of social integration for refugees. The higher the index, the stronger is the refugees' social integration. The values of the correspondent component loadings are shown in Supplemental Table S2. When reporting the results of our main estimation, we also report those for the individual items underlying the integration index.

### **[Figure 1 about here]**

Figure 1 shows the distribution of the index for men and women separately. The curves show the index for parents of children under the age of seven as well as for two comparison groups: parents of older children and refugee adults without children.<sup>9</sup> We observe that the distributions are rather similar for men, while women without children show higher values than mothers, in particular those with younger children.

## **5 Results**

### **5.1 Average Differences and Stochastic Dominance**

We test for differences in the social integration of refugee parents with children aged 0-6 attending ECEC and those whose children do not attend. Table 2 shows the differences between the two groups in the means of the social integration index as well as the individual items used to construct it. A higher value for a given item points to a higher social integration within this dimension.<sup>10</sup> The index average value is 20% higher for parents whose children do attend ECEC, who also score relatively better on all underlying items.

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<sup>9</sup> Note that adults without children could be parents whose children are not living in the same household at the time of the interview. However, the proportion of parents whose minor children have not reached Germany is less than 10% of the adult refugee population (Gambaro et al. 2018).

<sup>10</sup> The sample to compute these average differences comprises more observations because we do not restrict to the availability of information on all control variables, as in the final sample.

**[Table 2 about here]**

Figure 2 shows cumulative distribution functions of the social integration index by children’s ECEC attendance. Refugees without children are also included as benchmark. The show that the social integration of refugees with children in ECEC stochastically dominates the distribution of the other group, while both are dominated by the distribution of refugees without children. We perform a Kolmogorov-Smirnov test for equality of distribution functions that confirms that the difference between the curves is statistically significant (the p-value of the test is 0.000).

**[Figure 2 about here]**

## **5.2 Multivariate Regressions**

Table 3 reports the estimated coefficients of Equation (1). We observe that ECEC attendance of children is positively associated in all specifications with the social integration of their parents, holding individual, family, and county-specific characteristics constant.<sup>11</sup> The size of the coefficient is more than two times higher for the subsample of mothers compared to the fathers. The OLS estimates suggest that the conditional, average increase in integration of mothers when their child attends ECEC is approximately equivalent to an additional three years of residency in Germany.

**[Table 3 about here]**

Other characteristics positively associated with social integration are the presence of a child in school age in the household. In contrast, larger families are significantly associated with lower degrees of social integration. Human capital shows up as a strong driver of social integration: health status, language knowledge (German and English), and schooling are all associated with higher social integration. Lastly, the inclusion of county characteristics is crucial for

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<sup>11</sup> Including members of the extended family, e.g. grandparents and older siblings, does not significantly change the results. Estimations on this very small subsample of 134 observations yield suggestive evidence for a positive effect of ECEC attendance on other family members as well.

increasing model precision. Not surprisingly, the county average social integration among all refugees without children is positively associated with parental social integration. However, the inclusion of this and the other county-level variables in the regression does not alter the coefficient of ECEC attendance substantially, indicating that the positive impact of ECEC attendance on parental integration is not explained by an overall favorable local environment benefiting *all* refugees.

**[Figure 3 about here]**

In an attempt to further analyze the importance of ECEC for social integration, abstracting from the contribution of the location-specific component, we estimate a slightly changed version of our empirical model shown in equation (1). We allow the relationship between parental social integration ( $s^*$ ) and their child's ECEC attendance ( $c$ ) to vary depending on the county average social integration of refugees without children ( $\bar{s}_k$ ) by interacting  $c$  with  $\bar{s}_k$ . Figure 3 shows the linear predictions of  $s^*$  at different percentiles of the distribution of  $\bar{s}_k$ .<sup>12</sup> The covariates included in the regressions are the same as in Table 3, column (4). It shows that, as expected, in counties with higher average integration refugee parents with young children can also better integrate. However, irrespective of the average social integration of refugees in the place of residence, parents with children in ECEC have greater social integration than parents whose children do not attend. The gap between the two groups is substantially smaller in counties where the social integration of childless refugees is below the median. This result confirms the existence of individual selection effects into ECEC as well as the confounding effect of the local context, which need to be taken into account, as we do in the next step of the analysis.

### 5.3 IV Estimates

So far our strategy has controlled as comprehensively as possible for differences across counties, ensuring that the coefficient on ECEC attendance does not reflect the general suitability of a county to the integration of refugees. It remains,

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<sup>12</sup> Supplemental Figure S5 shows the interaction effect for the 2SLS estimates.

however, the case that individual selection effects could bias our estimates. Guichard (2020) has pointed to substantial differences in the self-selection of humanitarian migrants to Germany, with refugees from Iraq and Syria positively selected on education relatively to their home country of population (see also Spörlein and Kristen 2019). This suggests that we should expect heterogeneity across refugees in relation to both their motivation and ability to integrate and their confidence in using ECEC services. To deal with this, we apply a factor-based instrumental variable approach. As explained in Section 3, our instrument is a county-level ECEC supply score obtained by a principal component analysis of the median children-to-caregiver ratios for different age groups as well as the ECEC attendance rates for children under three and from three to six. Table 4 shows all the relevant estimates for all parents, as well as separately for fathers and mothers.<sup>13</sup> The table also reports the benchmark OLS estimates along with the reduced form estimates, and the first and second stages of the 2SLS procedure. The OLS estimates included in the second column show that when the instrument and the endogenous variable are included simultaneously, the instrument is not statistically significant. Although not enough to warrant the fulfilment of the exclusion restriction, this is a first suggestion that the ECEC score is a suitable instrument, as supply has no direct correlation with the social integration of refugees, but only through its correlation with the ECEC attendance by children living in the household.

#### **[Table 4 about here]**

Our main findings can be summarized by comparing the OLS estimates in the first column to the second stage of the 2SLS in the last column within each subgroup-estimation. The coefficient of the IV estimation is twice the size of the OLS for mothers, while lower and statistically undistinguishable from zero for fathers. This finding clearly shows that ECEC attendance of children affects the social

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<sup>13</sup> Supplemental Table S3 reports estimates of a model including, as instruments, all the variables used to construct the ECEC supply score separately instead of the supply score itself as the single instrument. As expected, the precision of the estimated declines but the effect size remains similar.

integration of their mothers. The effect for fathers is smaller than the OLS estimate would suggest and we cannot exclude that there is no effect at all.

The first stage of the 2SLS is highly significant for the subsample of mothers (and the overall sample of parents) and weakly significant for fathers; the F-statistic of the first stage is 17.68 for mothers and 3.48 for fathers.<sup>14</sup> The two coefficients are nonetheless qualitatively similar and their equality cannot be rejected at the 5% level. One explanation of the lower power of the instrument in the subsample of fathers could be due to fathers' lesser knowledge of their children's enrolment in ECEC. Given that fathers are more likely than mothers to be the only survey respondent in the household, their more imprecise responses on ECEC will disproportionately affect their sample, introducing a non-systematic measurement error to a greater extent than in the sample of mothers. Indeed, the standard error of the IV is slightly higher for the sample of fathers.<sup>15</sup>

Our findings clearly show that the effect of children's attendance in ECEC is effective on mothers. Local ECEC supply is highly correlated with their children's ECEC attendance, which in turn has a substantial beneficial impact on their social integration. The IV estimate nearly doubles in size with respect to the OLS estimate and shows that, in this case, the social integration index is 80% higher for mothers whose children attend ECEC. For fathers, the lower precision of the IV in the first stage affects the standard errors in the second stage and might bias the coefficient. We cautiously interpret this as suggestive that children's ECEC attendance may have no effect on their fathers' social integration.

Assuming it is mainly mothers dropping off and picking up children at the ECEC center, it is not surprising that they benefit more from the social contacts ECEC attendance brings than do fathers. It could also be that mothers benefit indirectly

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<sup>14</sup> In our main application, standard errors are clustered by counties. Clustering them at the federal state level (16 clusters) the F-Statistics of the first stage are 4.36 and 24.37 for fathers and mothers, respectively.

<sup>15</sup> Our interpretation is supported by the fact that for households in which the mother responded to the questionnaire, the correlation between the instrument and ECEC participation of their children is highest. When restricting the sample to those households where only the father filled out the survey questionnaire the instrument is not significantly different from zero with a large standard error.

by being relieved from caring duties. While their children are attending ECEC, they can have the time to connect to the local community and to access training and employment services. Searching for an explanation for the large effect for mothers, we notice that the likelihood for children to attend ECEC is particularly high in counties in the two highest deciles of the distribution of the ECEC supply index (see Supplemental Figure S6). We examine mothers living in those counties with a very high ECEC supply score and whose children attend ECEC (compliers) and compare them to mothers in all other counties whose children do not attend (non-compliers). Among the compliers, the share of single mothers is higher.<sup>16</sup> Furthermore, on average, complying mothers are older, and have fewer younger, but more older children (see Supplemental Table S4). Hence, disadvantaged families appear more likely to increase take-up if ECEC is largely available, benefiting from its positive effect in terms of social integration. Even if averaged across all our specifications, the effect of ECEC on the integration of mothers would remain approximately 52%.

#### **5.4 Separate analysis for each outcome component**

So far we have measured integration through a composite index, capturing four different dimensions of how refugees are initially settling in Germany and their integration prospects. It could be that ECEC attendance affects some specific dimensions more strongly than others, for example, language and social inclusion over employment prospects. Therefore, we run the analysis separately for each index component, doing so for fathers and mothers separately (Table 5).

**[Table 5 about here]**

As expected from the aggregate results, in the case of fathers (top panel), ECEC attendance does not appear to alter any dimension of integration. For mothers, the effect seems to run through language skills and perceived employment prospects. In particular, the 2SLS coefficients of language proficiency, oral and written, are

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<sup>16</sup> When conducting an analysis of two subgroups – single mothers and mothers living with their husbands – separately, the effect size among the two groups are statistically not different from one another, showing that the overall effect of ECEC attendance is not driven by single-mothers.

significantly higher than the OLS ones. The effect of perceived probability of future employment in Germany is almost four times higher than the OLS estimate. The very low number of employed mothers makes the standard error of the IV estimate rather high, but again the IV coefficient is around four times higher than the OLS estimate. Finally, we find a significant effect of ECEC attendance on being less likely to miss people from the home country. In conclusion, the effect of ECEC attendance on the integration of refugees is not driven by a single item of the social integration index.

## **5.5 Longer-run Effects**

We exploit the fact that some families were interviewed twice, with the second interview occurring approximately one year after the first. This longitudinal sample contains 291 fathers and 243 mothers. On these observations, we first run a panel model including individual fixed effects, which allows controlling for individual observed and unobserved heterogeneity. The estimates measure the change in social integration associated to a change in one child's attendance in ECEC. The results, shown in Table 6, confirm the IV analysis, pointing to no significant effect for fathers but a significant effect of ECEC on the social integration of mothers. Furthermore, the positive significant coefficients of the average social integration of other refugees in the county reiterate the importance of the local context for social integration. The results also reveal a penalty in terms of social integration that mothers sustain for the birth of a new child.

**[Table 6 about here]**

Secondly, we use the longitudinal sample to test whether one additional year of ECEC has a stronger effect on the social integration of parents than one year of attendance only. Table 7 reports estimates obtained by running a linear regression model including the control variables measured in the first survey round. The coefficient of two years in ECEC is greater than that for only one year in ECEC, confirming the intuition that longer attendance brings additional benefits. In fact, even for fathers, two years in ECEC is significantly associated with higher social integration against no ECEC experience. This could be explained as a ripple effect:

as children become familiar with the host country language and culture, fathers themselves may gain some additional exposure to German habits and norms, perhaps becoming more motivated to integrate.

**[Table 7 about here]**

## **5.6 Robustness**

The key assumption of the instrumental variable approach is that the ECEC supply score creates an exogenous variation in ECEC participation by refugee children but is uncorrelated with refugee parents' unobserved determinants of integration and counties' characteristics that favor refugees' integration. In this section we test the robustness of these assumptions. A problem might exist if refugees self-select into counties with a higher ECEC supply score on the basis of factors that favor integration. We do not find any evidence that this may be the case. First, the process of allocation of refugees to counties appears to be random and surely not correlated with ECEC factors. The correlation between the county-level flow of refugee children under the age of seven and the ECEC attendance rates of children aged 0-2 and 3-5 in that county is close to zero (Figure S7 in the Supplemental Material). The same applies for the ECEC supply score, our instrument. More generally, we do not find any systematic pattern of association between specific county-level characteristics and the number of resident refugee children under the age of seven (Supplemental Table S11), suggesting that families with young children are not clustered into a subset of counties. Second, we perform balancing tests to verify whether the ECEC supply score of a county, our instrument, is systematically related to the observable characteristics of refugees in that county (see Supplemental Figures S8-S9 and Supplemental Table S11). No systematic pattern emerges, neither when including refugees with young children only nor when examining all refugees. Third, in our longitudinal sample, we observe that although a fairly large share of refugee families with children under seven moved to a different home between the first and second waves (36%), only 4% moved to another county. It is indeed very unlikely that refugee families would move specifically with the intention to find an area with better ECEC



opportunities, given that such information is difficult to obtain and to act upon (Camehl et al. 2018).

Another possible threat to our identification strategy is that counties with greater capacity and willingness to integrate refugees also offer better ECEC opportunities. To control for this possibility, we perform a balancing test to verify whether the ECEC supply score of a county, our instrument, is systematically related to county-level factors that could promote refugees' integration. These include county's characteristics such as unemployment rate, tax capacity, and share of right-wing votes, as well as information on provision targeted at refugees, such as refugees' completion rate of integration courses, share of accepted asylum applications, and the share of refugees receiving social benefits (Supplemental Figure S10 and Supplemental Table S11). The results do not indicate that the ECEC supply could be related to other community resources. To be sure, we perform a placebo test of the first stage regression on the samples of refugees without children and with children older than six (Supplemental Table S5). The instrument, county ECEC supply, does not have a significant relationship with the social integration of individuals in either of these groups. Hence, no evidence points against the fulfilment of the exclusion restriction: the ECEC supply score is related to the social integration of refugee parents with children under school age only because it promotes refugee children's attendance in ECEC.

When performing our analysis on the individual components of the integration index, participation in training, language or integration courses did not appear to be driving the overall result. Nonetheless, an issue requiring some attention is ECEC provision attached to integration courses (this is known as *Integrationskursbegleitende Kinderbetreuung*). This provision guaranteed ECEC services for preschool children of refugees who were taking part in integration courses and could not make suitable alternative arrangements. The potential provision was abolished in September 2014 and reintroduced in March 2017. The first wave of interviews of the IAB-BAMF-SOEP survey took place between June and December 2016 and, hence, no child included in the survey should have been in one of these ECEC programs at the time of the fieldwork. Some families in the

survey who arrived in Germany before October 2014 could have benefitted from this special ECEC opportunity. This could have created persistent effects on their language knowledge and course participation, on the one hand, and on ECEC attendance of their children, on the other. To check for this, we perform a sensitivity analysis excluding all families that arrived before October 2014. The results confirm our main findings (see Supplemental Table S6).

Finally, our results on the effect of children’s participation in ECEC are based on a binary variable indicating whether at least one child in the household is attending. We check if we get similar results when performing the whole analysis using the number, as well as the share of children in the household attending ECEC. The estimates we obtain are very similar, and even more precise given the higher statistical power of the prediction in the first stage regression (see Supplemental Figure S11 and Tables S7-S10).

## **6 Conclusions**

In the last decade, EU countries have seen a sharp increase in the number of refugees applying for asylum, with more than 3.5 million applicants between 2015 and 2019. While flows have abated since 2017, the challenge of integrating refugees remains acute, especially in Germany, where, as of 2017, about 1.7 million asylum applicants, including around 180,000 children under seven, were estimated to live (Destatis 2019). Successful integration can bring a double dividend: for refugees, who are seeking to resettle and start a new life, as well as for receiving countries, where the initial fiscal costs of providing assistance can be offset by the substantial economic contribution refugees can make if they succeed in integrating (Fasani et al 2018; Aiyar et al 2016).

This paper investigates whether children’s participation in ECEC services increases the integration of their parents. So far, interest in the role of ECEC services in relation to refugees and immigrants mainly pertains to children, with evidence suggesting early exposure to the language and culture of the host country is particularly beneficial for these groups of children. By shifting the focus from children to parents, this paper offers new findings, pointing to the positive impact

ECEC services can have on the integration of refugee parents who have recently arrived in Germany. Because it is far too early to assess parental integration on the basis of their labor market performance, we construct an index summarizing information along four dimensions: current and future employment; participation in training and language courses; German language proficiency; and feelings of social inclusion. We have the advantage of relying on a relatively rare source of rigorously collected information on refugees in Germany. The IAB-BAMF-SOEP survey provides a nationally representative sample of refugees who applied for asylum in Germany between 2013 and 2016, including detailed information on respondents and their children. Matching this data with information on ECEC supply factors and the socio-economic characteristics of the area where respondents live allows us to study the integration process including both sides of the equation: refugees and receiving communities.

Our estimation strategy exploits the heterogeneity of ECEC places and care personnel available across German counties to derive causal estimates of the effect of ECEC attendance of children on the social integration of their families. By controlling for the average social integration of refugees without children or with children attending school, whose integration depends on the overall suitability of the county they are assigned to, but not on its ECEC provision, we ensure that our estimates are not biased by unobserved features of the local context that could drive the social integration of refugees. We find a strong effect of ECEC attendance on the social integration of mothers, but not of fathers. One likely explanation of the gendered pattern of the results is that mothers are more likely than fathers to be in charge of dealing with care and education services, bringing and picking up children. Another possible explanation is that ECEC attendance relieves mothers, rather than fathers, from caring activities, enabling them to use the hours their children are in ECEC to acquire linguistic knowledge and generally become actively engaged in the integration process. Although the present research cannot investigate the precise mechanisms underlying this effect, the results seem to converge with recent evidence on the specific challenges of refugee women, who are found to be at disadvantage compared to refugee men (Schmidt et al. 2020). In particular, caring responsibilities tend to exacerbate refugee women's isolation, to

lower their employment expectations and to ultimately delay their integration process in comparison to men's (De Maio et al. 2017; Graeber and Schikora 2020; Liebig and Tronstad 2018). Access to ECEC services could, in this scenario, help reduce mothers' isolation and boost their confidence.

When examining the individual components of the integration index, we find effects on self-assessed language proficiency and employment prospects, but not on other dimensions. The finding on language is welcome, given that among the recently arrived refugees in Germany, less than one in five mothers is found to have good German proficiency, a much lower proportion than among fathers or childless adults (Brücker et al. 2019). The result also suggests that ECEC may offer a good opportunity to speak German or listen to it. While we do not find evidence that these interactions result in social ties with native Germans, nevertheless they appear to provide sufficient language exposure to improve mothers' proficiency in German. It could also be that the availability of ECEC services is perceived by parents as a welcoming sign, encouraging a positive attitude toward their integration prospects. This interpretation is in line with the finding that ECEC increases maternal well-being (e.g. Schmitz 2019). ECEC may also favor parents' integration indirectly, via the children. With time, refugee children attending ECEC learn the language and become familiar with the culture of the host country, potentially forcing parents to accelerate their own integration process. In this case, human capital spill-overs within the family take place while parents learn from their children (Kuziemko 2014). Such an indirect effect could be driving the (rather weak) positive influence of ECEC on paternal integration uncovered by the longitudinal analysis.

It is important to appreciate that our outcome is a short-term measure while integration is a decade long, complex process influenced by many factors. But while ECEC centers cannot alone solve the problem of integration, our findings suggest that they can clearly contribute, possibly more than is conventionally thought. In order to increase ECEC impact, a number of challenges remain. First, the allocation of refugee families does not take into account the suitability of receiving areas, for example in terms of service infrastructure. Yet, it is beneficial for

integration of both parents and children to ensure that families with young children are allocated where they can have access to ECEC services. Second, ECEC centers could be equipped with resources to become family hubs where parents can access training support and overcome isolation, as in integrated or dual generations centers in the UK or the US (Chase-Lansdale and Brooks-Gunn 2014; Eisenstadt 2011). Third, measures to increase the culture-sensitivity of ECEC staff could be broadly beneficial, helping refugee parents feel welcome. Refugee families confront a host of challenges as they rebuild their lives. Community resources are critical ingredients in positive integration and ECEC centers should be considered as a key resource in this process.

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## Tables (in Text)

Table 1: Descriptive Statistics of the IAB-BAMF-SOEP Survey of Refugees in Germany  
Sample: Parents of children aged 0-6 (excluding children in school)

	Average	sd
Child in household attends ECEC (0/1)	0.55	0.497
No schooling degree (0/1)	0.38	0.486
Healthy (0/1)	0.89	0.309
Spoke no German before migration (0/1)	0.96	0.204
Good English (0/1)	0.24	0.426
Syrian origin (0/1)	0.60	0.491
Newborn in household (0/1)	0.21	0.410
School aged child in household (0/1)	0.43	0.495
Shared accomodation (0/1)	0.25	0.432
Age	31.89	6.876
Years in Germany	1.50	0.640
Number of children aged 0-2 in household	0.70	0.628
Number of children aged 3-6 in household	0.82	0.682
Self-Esteem (1 very low -7 very high)	6.34	1.170
Resilience (1 very low -7 very high)	6.32	1.100
Observations	1178	

*Notes:* Weighted averages and standard deviations. Variables with (0/1) are dummy variables; 0=No and 1=Yes. *Source:* IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

Table 2: Average differences of outcome variables used to compute the *social integration index* by ECEC attendance of at least one child in household

	No ECEC	N	ECEC	N	Difference
<i>Social integration index</i>	-0.20	650	0.41	880	-0.62***
<i>Language</i>					
German language: speaking (0-4 very good)	1.36	740	1.59	983	-0.23***
German language: reading (0-4 very good)	1.40	739	1.59	983	-0.19***
German language: writing (0-4 very good)	1.24	740	1.50	983	-0.26***
German language: interviewer assessment (0-4 very good)	1.20	740	1.51	983	-0.30***
<i>Social inclusion</i>					
Number of German acquaintances	3.98	722	5.42	950	-1.44***
Misses the company of others (1 very often - 5 never)	3.12	709	3.17	948	-0.05
Feels excluded (1 very often - 5 never)	3.64	707	3.69	954	-0.04
Feels socially isolated (1 very often - 5 never)	3.74	711	3.81	962	-0.07
Misses people from home country (1 very often - 5 never)	2.12	725	2.18	971	-0.06
<i>Training</i>					
Course participation (0/1)	0.59	740	0.71	980	-0.12***
<i>Employment</i>					
Currently employed (0/1)	0.05	740	0.08	983	-0.03**
Prob. of employment in Germany (0-100)	59.62	702	64.87	943	-5.25***

*Notes:* Unweighted sample averages. Sample comprises the parents of children aged 0-6 (excluding children in school). Statistical significance of the difference measured with a t-test. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . *Source:* IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

Table 3: ECEC attendance of refugee children and the social integration of their parents

	All					Fathers	Mothers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Child in household attends ECEC (0/1)	0.660*** (0.159)	0.583*** (0.164)	0.842*** (0.126)	0.824*** (0.126)	0.823*** (0.155)	0.481** (0.186)	1.138*** (0.256)
<i>Individual and family</i>							
Female (0/1)			-1.445*** (0.102)	-1.452*** (0.100)	-1.382*** (0.107)		
Age			-0.0400*** (0.00956)	-0.0403*** (0.00922)	-0.0321*** (0.0107)	-0.0322* (0.0173)	-0.0238 (0.0178)
Newborn in household (0/1)			-0.125 (0.185)	-0.118 (0.176)	-0.119 (0.191)	-0.0359 (0.188)	-0.227 (0.369)
School aged child in household (0/1)			0.466*** (0.117)	0.451*** (0.116)	0.331** (0.138)	0.206 (0.214)	0.391** (0.195)
Number of children aged 0-2 in household			-0.262*** (0.0965)	-0.287*** (0.0962)	-0.307*** (0.111)	-0.304* (0.154)	-0.227 (0.179)
Number of children aged 3-6 in household			-0.601*** (0.0730)	-0.621*** (0.0764)	-0.550*** (0.0862)	-0.484*** (0.110)	-0.606*** (0.144)
Self-Esteem (1 very low -7 very high)			0.0156 (0.0680)	0.0218 (0.0652)	0.0402 (0.0707)	0.0842 (0.106)	0.00144 (0.0856)
Resilience (1 very low -7 very high)			0.0856 (0.0769)	0.0874 (0.0757)	0.0495 (0.0788)	0.200** (0.0859)	0.0130 (0.143)
Good English (0/1)			1.493*** (0.178)	1.479*** (0.177)	1.535*** (0.222)	1.179*** (0.274)	1.917*** (0.365)
Healthy (0/1)			0.454*** (0.168)	0.467*** (0.167)	0.493*** (0.169)	0.586** (0.259)	0.828*** (0.284)
<i>Refugee specific</i>							
Spoke no German before migration (0/1)			-0.170 (0.282)	-0.116 (0.270)	-0.0388 (0.313)	0.219 (0.377)	-0.316 (0.582)
Years in Germany			0.309*** (0.0898)	0.306*** (0.0907)	0.352*** (0.0993)	0.302** (0.144)	0.328* (0.172)
No schooling degree (0/1)			-0.968*** (0.111)	-0.976*** (0.111)	-0.882*** (0.116)	-1.037*** (0.175)	-0.891*** (0.195)
Syrian origin (0/1)			-0.173 (0.121)	-0.183 (0.121)	-0.162 (0.145)	0.0571 (0.197)	-0.373* (0.214)
Shared accomodation (0/1)			-0.184 (0.155)	-0.248* (0.147)	-0.278 (0.175)	-0.621*** (0.205)	0.133 (0.297)
<i>County level</i>							
s* of refugees w/o children, county avg				0.169*** (0.0498)			
s* of refugees w/ children in school age, county avg				0.0641 (0.0578)			
County average log household income				0.296 (0.890)			
County unemployment rate				-0.0500 (0.0558)			
County share of foreigners				0.0100 (0.0131)			
County share of center-right-wing voters				-0.498 (1.343)			
Federal State FE	No	Yes	Yes	Yes	No	No	No
County FE	No	No	No	No	Yes	Yes	Yes
Observations	1178	1178	1178	1178	1178	602	576
Adjusted R <sup>2</sup>	0.027	0.043	0.422	0.427	0.472	0.491	0.373
Mean of s	0.103	0.103	0.103	0.103	0.103	0.732	-0.460
Min	-3.726	-3.726	-3.726	-3.726	-3.726	-3.491	-3.726
Max	6.058	6.058	6.058	6.058	6.058	6.058	5.494

*Notes:* Linear regressions. Sample comprises the parents of children aged 0-6 (excluding children in school). Dependent Variable: *Social Integration Index s\** (principal component analysis of the variables included in Table 2). Variables with (0/1) are dummy variables; 0=No and 1=Yes. Standard errors clustered by counties in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . *Source:* IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

Table 4: Instrumental variables estimation: OLS, Reduced-form and 2SLS estimates.

	All				
	OLS	OLS	OLS Reduced Form	2SLS First Stage	2SLS Second Stage
Child in household attends ECEC (0/1)	0.824*** (0.126)	0.812*** (0.126)			1.546 (1.019)
County ECEC-supply score		0.0866 (0.124)	0.182 (0.131)	0.118*** (0.0314)	
Individual and family controls	Yes	Yes	Yes	Yes	Yes
Refugee specific controls	Yes	Yes	Yes	Yes	Yes
County level controls	Yes	Yes	Yes	Yes	Yes
Federal state FE	Yes	Yes	Yes	Yes	Yes
Observations	1178	1178	1178	1178	1178
Fstat				14.08	
	Fathers				
	OLS	OLS	OLS Reduced Form	2SLS First Stage	2SLS Second Stage
Child in household attends ECEC (0/1)	0.529*** (0.150)	0.532*** (0.151)			0.131 (2.585)
County ECEC-supply score		-0.0277 (0.181)	0.00907 (0.187)	0.0692* (0.0371)	
Individual and family controls	Yes	Yes	Yes	Yes	Yes
Refugee specific controls	Yes	Yes	Yes	Yes	Yes
County level controls	Yes	Yes	Yes	Yes	Yes
Federal state FE	Yes	Yes	Yes	Yes	Yes
Observations	602	602	602	602	602
Fstat				3.481	
	Mothers				
	OLS	OLS	OLS Reduced Form	2SLS First Stage	2SLS Second Stage
Child in household attends ECEC (0/1)	1.088*** (0.185)	1.058*** (0.186)			2.193** (1.039)
County ECEC-supply score		0.170 (0.156)	0.328** (0.161)	0.150*** (0.0356)	
Individual and family controls	Yes	Yes	Yes	Yes	Yes
Refugee specific controls	Yes	Yes	Yes	Yes	Yes
County level controls	Yes	Yes	Yes	Yes	Yes
Federal state FE	Yes	Yes	Yes	Yes	Yes
Observations	576	576	576	576	576
Fstat				17.68	

*Notes:* Linear regressions. Sample comprises the parents of children aged 0-6 (excluding children in school). Dependent Variable: *Social Integration Index s\** (principal component analysis of the variables included in Table 2). Included control variables are the same as in column (4) of Table 4. Standard errors clustered by counties in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . *Source:* IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

Table 5: Instrumental variable estimates: Single components of social integration index

<i>Fathers</i>												
	Course participation		German acq.		Speaking Ger		Reading Ger		Writing Ger		Assessment Ger	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Child in household attends ECEC (0/1)	0.198*** (0.0510)	0.0335 (0.538)	0.619 (0.801)	10.29 (16.75)	0.177** (0.0796)	-0.538 (1.032)	0.168** (0.0734)	-0.939 (1.864)	0.224*** (0.0751)	0.594 (1.552)	0.321* (0.164)	0.641 (1.866)
Observations	602	602	602	602	602	602	602	602	602	602	602	602
	Employed		Prob(employment)		Company		Excluded		Isolated		Home country	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Child in household attends ECEC (0/1)	0.0122 (0.0312)	0.330 (0.339)	-0.384 (2.418)	9.384 (34.41)	0.142 (0.173)	-1.246 (2.248)	0.102 (0.148)	-1.621 (2.215)	0.226 (0.156)	-0.177 (1.664)	0.0279 (0.185)	2.525 (2.221)
Observations	602	602	602	602	602	602	602	602	602	602	602	602
<i>Mothers</i>												
	Course participation		German acq.		Speaking Ger		Reading Ger		Writing Ger		Assessment Ger	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Child in household attends ECEC (0/1)	0.214*** (0.0588)	-0.0205 (0.275)	0.722 (0.830)	-6.011 (7.347)	0.410*** (0.0914)	1.048** (0.478)	0.432*** (0.101)	1.211* (0.634)	0.465*** (0.0999)	1.457** (0.575)	0.658*** (0.160)	1.048 (0.845)
Observations	576	576	576	576	576	576	576	576	576	576	576	576
	Employed		Prob(employment)		Company		Excluded		Isolated		Home country	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Child in household attends ECEC (0/1)	0.0302** (0.0144)	0.121 (0.103)	12.77*** (4.312)	46.38** (23.52)	0.134 (0.138)	-0.0767 (0.896)	0.148 (0.133)	-0.522 (0.836)	0.254* (0.149)	-0.412 (0.852)	0.173 (0.138)	1.408* (0.837)
Observations	576	576	576	576	576	576	576	576	576	576	576	576

Notes: Linear regressions. Sample comprises the parents of children aged 0-6 (excluding children in school). Dependent variable indicated above the estimation results; for a more exhaustive description of the single items, see Table 2. Excluded instrument is the county ECEC score. Included control variables are the same as in column (4) of Table 4. Variables with (0/1) are dummy variables; 0=No and 1=Yes. F-statistics of the First Stage same as in Table 5. Standard errors clustered by counties in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Source: IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.



Table 6: Longitudinal estimates: Individual fixed effects regressions

	All			Fathers			Mothers		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
At least one child in household attends ECEC (0/1)	0.549*** (0.119)	0.270** (0.110)	0.311*** (0.118)	0.579*** (0.161)	0.136 (0.146)	0.163 (0.156)	0.516*** (0.177)	0.366** (0.167)	0.438** (0.179)
Social integration of refugees w/o children, county avg		0.398*** (0.0510)	0.379*** (0.0521)		0.404*** (0.0711)	0.387*** (0.0731)		0.379*** (0.0737)	0.379*** (0.0743)
Social integration of refugees w/ children in school age, county avg		0.197*** (0.0515)	0.194*** (0.0517)		0.333*** (0.0727)	0.329*** (0.0732)		0.0831 (0.0737)	0.0980 (0.0731)
Number of children aged 0-2 in household			-0.0554 (0.143)			-0.228 (0.187)			0.157 (0.220)
Number of children aged 3-6 in household			-0.103 (0.128)			-0.0679 (0.165)			-0.0930 (0.197)
Newborn in household (0/1)			-0.141 (0.121)			0.162 (0.153)			-0.525*** (0.195)
School aged child in household (0/1)			0.340 (0.262)			0.575* (0.333)			-0.158 (0.413)
Federal state FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	1068	1068	1068	582	582	582	486	486	486
Individuals	534	534	534	291	291	291	243	243	243

*Notes:* Panel regressions with individual fixed effects. Sample comprises the parents of children aged 0-6 (excluding children in school). Dependent Variable: *Social Integration Index s\** (principal component analysis of the variables included in Table 2). Variables with (0/1) are dummy variables; 0=No and 1=Yes. Standard errors clustered by counties in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .  
*Source:* IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

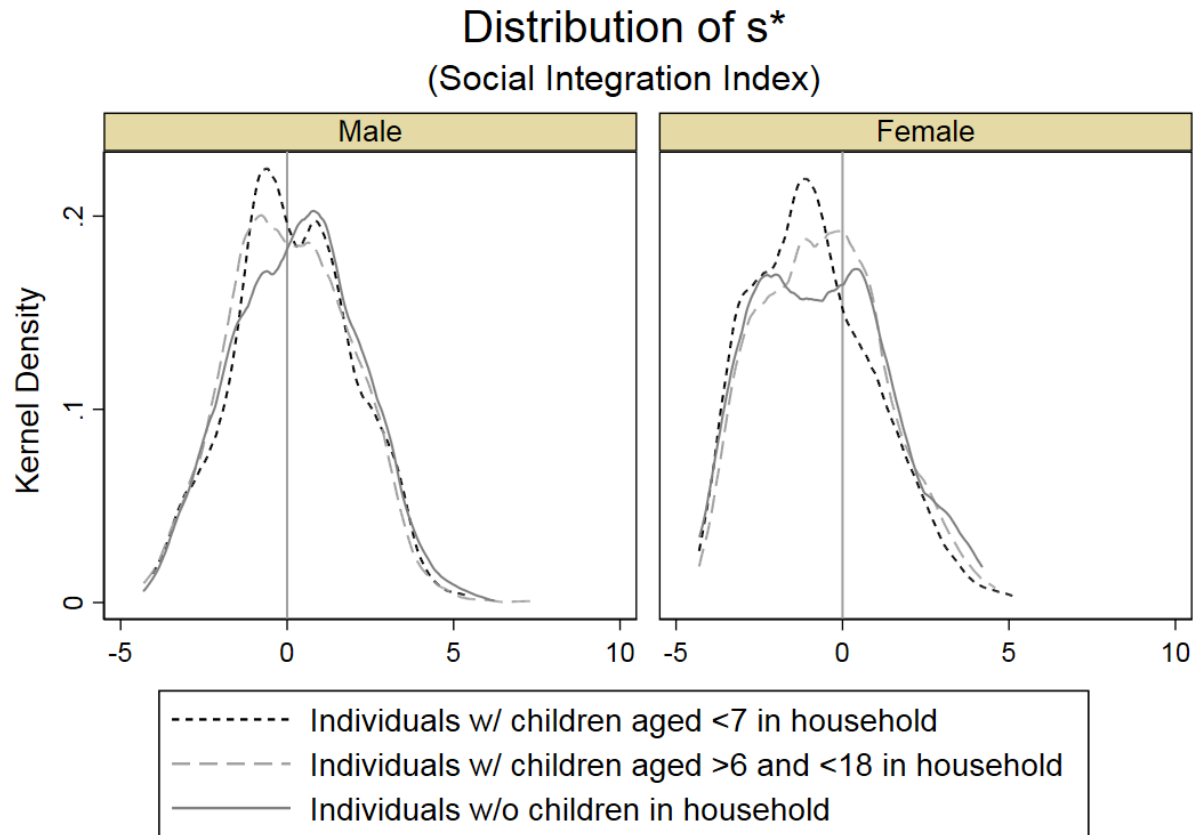
Table 7: Longitudinal estimates: ECEC interaction terms

	(1) All	(2) Fathers	(3) Mothers
Years in ECEC=0			
Years in ECEC=1	0.608** (0.295)	0.347 (0.372)	0.918*** (0.341)
Years in ECEC=2	1.013*** (0.326)	0.779** (0.391)	1.310*** (0.322)
Female (0/1)	-0.953*** (0.199)		
Age	-0.0218 (0.0173)	-0.0407** (0.0186)	0.0107 (0.0236)
Newborn in household (0/1)	-0.360 (0.302)	-0.848** (0.364)	-0.0309 (0.450)
School aged child in household (0/1)	0.157 (0.336)	0.245 (0.390)	-0.0295 (0.481)
Individual and family controls	Yes	Yes	Yes
Refugee specific controls	Yes	Yes	Yes
County level controls	Yes	Yes	Yes
Federal State FE	Yes	Yes	Yes
Observations	457	244	213

*Notes:* Linear regressions. (No) ECEC in  $t$  is one if in survey year  $t$  at least one child in the household was (not) enrolled in ECEC and zero otherwise. Sample comprises the parents of children aged 0-6 (excluding children in school). Dependent Variable: *Social Integration Index  $s^*$*  (principal component analysis of the variables included in Table 2). Variables with (0/1) are dummy variables; 0=No and 1=Yes. Standard errors clustered by counties in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . *Source:* IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

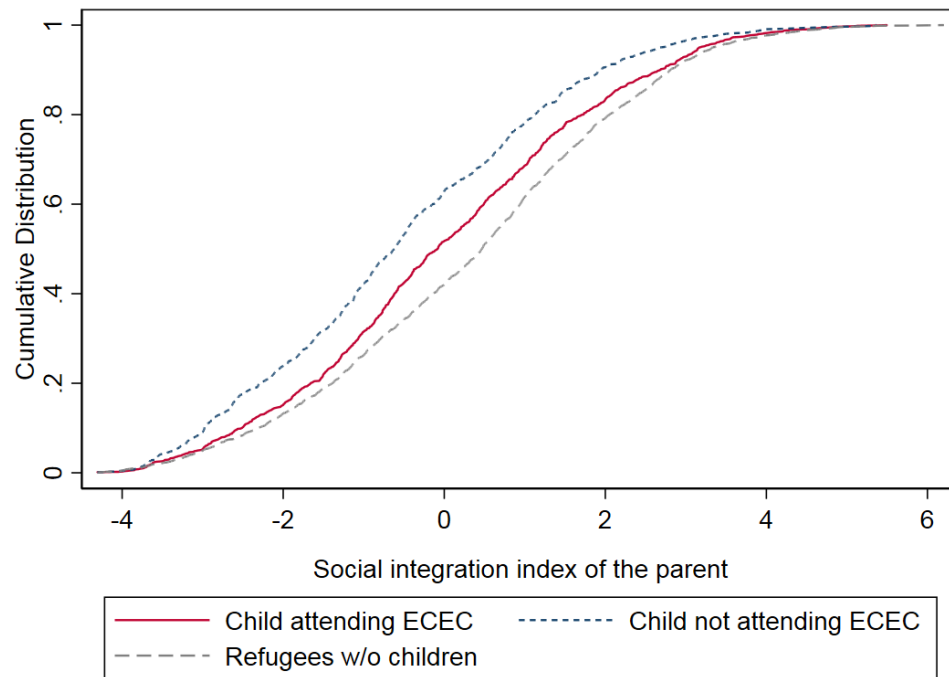
## Figures

Figure 1: *Social integration index*: Distribution for men and women



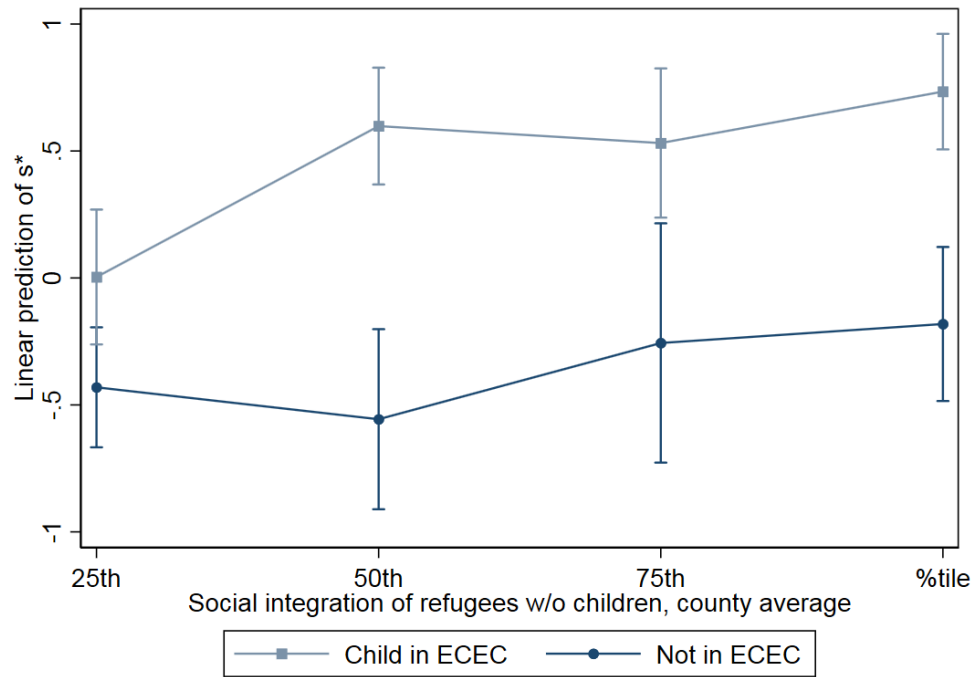
Source: IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

Figure 2: *Social integration index*: Distribution by children's ECEC attendance



Source: IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

Figure 3: *Social integration index*: Linear prediction of interaction between ECEC and average social integration of refugees w/o children



Notes: Dependent Variable: *Social Integration Index  $s^*$*  (principal component analysis of the variables included in Table 2). Included control variables are the same as in Table 3 column (4). Confidence interval shown at 90%. Standard errors clustered by counties in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Source: IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

**S   Supplementary Material**

Table S1: Component loading of the IV for components with  $\lambda > 1$

	1st Component	2nd Component	3rd Component
Children-Caregiver ratio (nurseries)	0.512	-0.142	-0.122
Children-Caregiver ratio (age <4)	0.515	-0.054	-0.152
Children-Caregiver ratio (all ages)	0.462	-0.218	0.794
ECEC attendance rate (age 0-2)	0.488	0.129	-0.530
ECEC attendance rate (age 3-5)	0.145	0.955	0.226

Table S2: Component loading of  $s^*$  for components with  $\lambda > 1$ 

	1st Component	2nd Component	3rd Component	4th Component
Course participation (0/1)	0.277	-0.036	-0.268	0.243
Number of German acquaintances	0.188	0.037	0.415	-0.489
German language: speaking (0-4 very good)	0.454	-0.113	-0.015	-0.001
German language: reading (0-4 very good)	0.461	-0.123	-0.125	-0.007
German language: writing (0-4 very good)	0.461	-0.114	-0.157	-0.025
German language: interviewer assessment (0-4 very good)	0.358	-0.132	0.046	-0.118
Prob. of employment in Germany (0-100)	0.236	-0.024	0.130	0.451
Misses the company of others (1 very often - 5 never)	0.101	0.524	0.044	0.077
Feels excluded (1 very often - 5 never)	0.121	0.558	-0.181	-0.174
Feels socially isolated (1 very often - 5 never)	0.148	0.531	-0.163	-0.167
Misses people from home country (1 very often - 5 never)	0.053	0.263	0.379	0.634
Employed (0/1)	0.153	0.020	0.702	-0.131

Table S3: Instrumental variables estimation: all instruments.

	All					Fathers					Mothers				
	OLS	OLS	OLS Reduced Form	2SLS First Stage	2SLS Second Stage	OLS	OLS	OLS Reduced Form	2SLS First Stage	2SLS Second Stage	OLS	OLS	OLS Reduced Form	2SLS First Stage	2SLS Second Stage
Child in household attends ECEC (0/1)	0.824*** (0.126)	0.803*** (0.126)			1.935** (0.956)	0.529*** (0.150)	0.511*** (0.145)			1.833 (1.607)	1.088*** (0.185)	1.052*** (0.185)			2.277** (1.004)
Children-Caregiver ratio (nurseries)		-0.297 (0.285)	-0.278 (0.305)	0.0236 (0.0817)			-0.544 (0.345)	-0.600* (0.360)	-0.110 (0.0826)			-0.0113 (0.354)	0.137 (0.370)	0.141 (0.0969)	
Children-Caregiver ratio (age <4)		0.0956 (0.139)	0.160 (0.145)	0.0808* (0.0471)			-0.213 (0.197)	-0.156 (0.202)	0.112** (0.0508)			0.227 (0.174)	0.270 (0.182)	0.0405 (0.0559)	
Children-Caregiver ratio (all ages)		0.143 (0.109)	0.178 (0.109)	0.0438** (0.0207)			0.198 (0.135)	0.221 (0.139)	0.0458* (0.0251)			0.0947 (0.114)	0.139 (0.110)	0.0417* (0.0243)	
ECEC attendance rate (age 0-2)		0.0240 (0.0203)	0.0286 (0.0205)	0.00570 (0.00448)			0.0731*** (0.0246)	0.0755*** (0.0248)	0.00475 (0.00511)			-0.00977 (0.0235)	-0.00386 (0.0235)	0.00562 (0.00434)	
ECEC attendance rate (age 3-5)		-0.0281 (0.0239)	-0.0279 (0.0250)	0.000143 (0.00740)			-0.0772** (0.0388)	-0.0775** (0.0391)	-0.000490 (0.00769)			0.00646 (0.0301)	0.00952 (0.0305)	0.00291 (0.00875)	
Individual and family controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Refugee specific controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Federal State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1178	1178	1178	1178	1178	602	602	602	602	602	576	576	576	576	576
Fstat				3.346					1.960					3.856	

*Notes:* Linear regressions. Sample comprises the parents of children aged 0-6 (excluding children in school). Dependent Variable: *Social Integration Index s\** (principal component analysis of the variables included in Table 2). Included control variables are the same as in column (4) of Table 4. Standard errors clustered by counties in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . *Source:* IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.



Table S4: Average difference in observable characteristics among compliers in counties with high ECEC supply and non-compliers in counties with lower supply; Mothers

	low supply	high supply	Difference	p-value
Single mother (0/1)	0.12	0.32	-0.20	0.003
Age	27.56	30.16	-2.61	0.001
Newborn in household (0/1)	0.32	0.10	0.22	0.000
School aged child (0/1)	0.34	0.46	-0.12	0.106
Children aged 0-2	0.97	0.39	0.58	0.000
Children aged 3-6	0.43	0.96	-0.53	0.000
Self-Esteem (1 low-7 high)	6.20	6.07	0.13	0.494
Resilience (1 low-7 high)	6.22	6.42	-0.21	0.138
Good English (0/1)	0.24	0.33	-0.09	0.203
Healthy(0/1)	0.92	0.84	0.08	0.131
No German befor migration (0/1)	0.97	0.99	-0.02	0.167
Years in Germany	1.51	1.37	0.14	0.114
No schooling degree (0/1)	0.38	0.27	0.11	0.105
Syrian origin (0/1)	0.60	0.53	0.07	0.323
Shared accomodation (0/1)	0.28	0.26	0.02	0.819

*Notes:* Sample comprises the mothers of children aged 0-6 (excluding children in school) excluding never-takers and always-takers; i.e. families with no children in ECEC despite of living in a high ECEC supply county and families with children in ECEC despite of living in a low supply county. Variables with (0/1) are dummy variables; 0=No and 1=Yes. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . *Source:* IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

Table S5: Placebo Test: Relationship between ECEC supply score and social integration of refugees without children in age range from zero to six.

	All w/o children		Parents of older children		Women w/o children		Mothers of older children	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
County ECEC-supply score	-0.0115 (0.123)	0.138 (0.125)	0.0239 (0.151)	0.0931 (0.121)	0.123 (0.262)	0.413 (0.259)	0.221 (0.202)	0.0139 (0.175)
Female (0/1)		-0.568*** (0.177)		-0.652*** (0.116)				
Age		-0.0427*** (0.00478)		-0.0497*** (0.00497)		-0.0179* (0.0103)		-0.0504*** (0.00601)
Self-Esteem (1 very low -7 very high)		0.0458 (0.0473)		0.0136 (0.0657)		-0.165 (0.111)		0.0675 (0.0817)
Resilience: Handle difficult situations (1 very low -7 very high)		-0.00793 (0.0635)		0.0553 (0.0715)		0.0642 (0.104)		0.0493 (0.0696)
Good english (0/1)		0.865*** (0.114)		1.250*** (0.155)		1.059*** (0.322)		1.479*** (0.191)
Healthy (0/1)		0.398*** (0.125)		0.217 (0.179)		0.946*** (0.256)		0.228 (0.211)
Spoke no German before migration (0/1)		-1.000*** (0.185)		-0.841*** (0.159)		-0.618* (0.326)		-0.570*** (0.171)
Years in Germany		0.241*** (0.0685)		0.127 (0.0883)		0.101 (0.168)		0.450*** (0.105)
No schooling degree (0/1)		-0.940*** (0.121)		-0.818*** (0.151)		-1.279*** (0.252)		-0.853*** (0.177)
Syrian Origin (0/1)		0.337*** (0.0909)		-0.0175 (0.125)		0.142 (0.197)		-0.0356 (0.148)
Shared accomodation (0/1)		-0.751*** (0.111)		-0.396*** (0.121)		-0.661*** (0.206)		-0.0472 (0.177)
Federal State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1888	1652	1121	981	360	316	566	489
Adjusted R <sup>2</sup>	0.029	0.378	0.028	0.424	0.000	0.374	0.031	0.463

Notes: Linear regressions. In columns (1)-(2) and (5)-(6) the sample comprises refugees without children, in columns (3)-(4) and (7)-(8) refugee parents of children aged 7-18. Dependent Variable: *Social Integration Index s\** (principal component analysis of the variables included in Table 2). Standard errors clustered by counties in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Source: IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

Table S6: Robustness check: "Childcare attached to integration courses". Results for refugees who arrived from October 2014 onwards (No) and who arrived before October 2014 (Yes).

Fathers						
	No			Yes		
	OLS	2SLS First Stage	2SLS Second Stage	OLS	2SLS First Stage	2SLS Second Stage
Child in household attends ECEC (0/1)	0.473*** (0.159)		-1.024 (2.672)	1.229** (0.464)		8.159 (6.078)
County ECEC-supply score		0.0785* (0.0413)			0.127 (0.110)	
Observations	487	487	487	115	115	115
Fstat		3.609			1.340	
Mothers						
	No			Yes		
	OLS	2SLS First Stage	2SLS Second Stage	OLS	2SLS First Stage	2SLS Second Stage
Child in household attends ECEC (0/1)	1.043*** (0.192)		2.573** (1.244)	1.752*** (0.563)		3.556 (2.388)
County ECEC-supply score		0.139*** (0.0375)			0.123 (0.0892)	
Observations	463	463	463	113	113	113
Fstat		13.81			1.896	

*Notes:* Linear regressions. Sample comprises the parents of children aged 0-6 (excluding children in school). Dependent Variable: *Social Integration Index s\** (principal component analysis of the variables included in Table 2). Included control variables are the same as in column (4) of Table 4. Standard errors clustered by counties in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . *Source:* IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

Table S7: Number of children in ECEC. Instrumental variables estimation: OLS, Reduced-form and 2SLS estimates.

	All				
	OLS	OLS	OLS Reduced Form	2SLS First Stage	2SLS Second Stage
Children in household attending ECEC (no.)	0.613*** (0.111)	0.602*** (0.112)			1.172 (0.751)
County ECEC-supply score		0.0887 (0.124)	0.182 (0.131)	0.156*** (0.0377)	
Individual and family controls	Yes	Yes	Yes	Yes	Yes
Refugee specific controls	Yes	Yes	Yes	Yes	Yes
County level controls	Yes	Yes	Yes	Yes	Yes
Federal state FE	Yes	Yes	Yes	Yes	Yes
Observations	1178	1178	1178	1178	1178
Fstat				16.98	
	Fathers				
	OLS	OLS	OLS Reduced Form	2SLS First Stage	2SLS Second Stage
Children in household attending ECEC (no.)	0.398*** (0.132)	0.400*** (0.132)			0.0980 (1.938)
County ECEC-supply score		-0.0279 (0.183)	0.00907 (0.187)	0.0925** (0.0440)	
Individual and family controls	Yes	Yes	Yes	Yes	Yes
Refugee specific controls	Yes	Yes	Yes	Yes	Yes
County level controls	Yes	Yes	Yes	Yes	Yes
Federal state FE	Yes	Yes	Yes	Yes	Yes
Observations	602	602	602	602	602
Fstat				4.424	
	Mothers				
	OLS	OLS	OLS Reduced Form	2SLS First Stage	2SLS Second Stage
Children in household attending ECEC (no.)	0.835*** (0.144)	0.809*** (0.147)			1.632** (0.737)
County ECEC-supply score		0.166 (0.155)	0.328** (0.161)	0.201*** (0.0441)	
Individual and family controls	Yes	Yes	Yes	Yes	Yes
Refugee specific controls	Yes	Yes	Yes	Yes	Yes
County level controls	Yes	Yes	Yes	Yes	Yes
Federal state FE	Yes	Yes	Yes	Yes	Yes
Observations	576	576	576	576	576
Fstat				20.88	

*Notes:* Linear regressions. Sample comprises the parents of children aged 0-6 (excluding children in school). Dependent Variable: *Social Integration Index s\** (principal component analysis of the variables included in Table 2). Included control variables are the same as in column (4) of Table 4. Standard errors clustered by counties in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . *Source:* IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

Table S8: Number of children in ECEC. Longitudinal estimates: Individual fixed effects regressions

	All			Fathers			Mothers		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Number of children in household attending ECEC	0.362*** (0.0890)	0.233*** (0.0807)	0.287*** (0.0897)	0.251** (0.120)	0.0474 (0.104)	0.0767 (0.118)	0.494*** (0.133)	0.421*** (0.125)	0.490*** (0.135)
Social integration of refugees w/o children, county avg		0.399*** (0.0506)	0.381*** (0.0517)		0.413*** (0.0705)	0.396*** (0.0725)		0.370*** (0.0727)	0.375*** (0.0731)
Social integration of refugees w/ children in school age, county avg		0.207*** (0.0512)	0.205*** (0.0513)		0.339*** (0.0724)	0.336*** (0.0728)		0.0995 (0.0726)	0.118 (0.0721)
Number of children aged 0-2 in household			-0.0856 (0.144)			-0.229 (0.190)			0.129 (0.217)
Number of children aged 3-6 in household			-0.167 (0.132)			-0.0630 (0.176)			-0.190 (0.196)
Newborn in household (0/1)			-0.122 (0.121)			0.160 (0.153)			-0.481** (0.193)
School aged child in household (0/1)			0.333 (0.262)			0.579* (0.334)			-0.232 (0.408)
Federal State FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	1068	1068	1068	582	582	582	486	486	486
Individuals	534	534	534	291	291	291	243	243	243

*Notes:* Panel regressions with individual fixed effects. Sample comprises the parents of children aged 0-6 (excluding children in school). Dependent Variable: *Social Integration Index s\** (principal component analysis of the variables included in Table 2). Standard errors clustered by counties in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . *Source:* IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

Table S9: Share of children in ECEC. Instrumental variables estimation: OLS, Reduced-form and 2SLS estimates.

	All				
	OLS	OLS	OLS Reduced Form	2SLS First Stage	2SLS Second Stage
Children in household attending ECEC (share)	1.065*** (0.149)	1.054*** (0.149)			1.520 (0.988)
County ECEC-supply score		0.0559 (0.122)	0.182 (0.131)	0.120*** (0.0293)	
Individual and family controls	Yes	Yes	Yes	Yes	Yes
Refugee specific controls	Yes	Yes	Yes	Yes	Yes
County level controls	Yes	Yes	Yes	Yes	Yes
Federal state FE	Yes	Yes	Yes	Yes	Yes
Observations	1178	1178	1178	1178	1178
Fstat				16.73	
	Fathers				
	OLS	OLS	OLS Reduced Form	2SLS First Stage	2SLS Second Stage
Children in household attending ECEC (share)	0.733*** (0.175)	0.740*** (0.176)			0.114 (2.260)
County ECEC-supply score		-0.0496 (0.180)	0.00907 (0.187)	0.0793** (0.0345)	
Individual and family controls	Yes	Yes	Yes	Yes	Yes
Refugee specific controls	Yes	Yes	Yes	Yes	Yes
County level controls	Yes	Yes	Yes	Yes	Yes
Federal state FE	Yes	Yes	Yes	Yes	Yes
Observations	602	602	602	602	602
Fstat				5.302	
	Mothers				
	OLS	OLS	OLS Reduced Form	2SLS First Stage	2SLS Second Stage
Children in household attending ECEC (share)	1.380*** (0.220)	1.348*** (0.221)			2.256** (1.036)
County ECEC-supply score		0.132 (0.154)	0.328** (0.161)	0.146*** (0.0316)	
Individual and family controls	Yes	Yes	Yes	Yes	Yes
Refugee specific controls	Yes	Yes	Yes	Yes	Yes
County level controls	Yes	Yes	Yes	Yes	Yes
Federal state FE	Yes	Yes	Yes	Yes	Yes
Observations	576	576	576	576	576
Fstat				21.23	

*Notes:* Linear regressions. Sample comprises the parents of children aged 0-6 (excluding children in school). Dependent Variable: *Social Integration Index s\** (principal component analysis of the variables included in Table 2). Included control variables are the same as in column (4) of Table 4. Standard errors clustered by counties in parentheses. \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ . *Source:* IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

Table S10: Share of children in ECEC. Longitudinal estimates: Individual fixed effects regressions

	All			Fathers			Mothers		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Share of children in household attending ECEC	0.671*** (0.144)	0.428*** (0.132)	0.424*** (0.138)	0.589*** (0.200)	0.153 (0.179)	0.164 (0.185)	0.755*** (0.209)	0.643*** (0.196)	0.640*** (0.204)
Social integration of refugees w/o children, county avg		0.391*** (0.0508)	0.375*** (0.0521)		0.405*** (0.0712)	0.389*** (0.0732)		0.369*** (0.0729)	0.370*** (0.0738)
Social integration of refugees w/ children in school age, county avg		0.208*** (0.0511)	0.205*** (0.0513)		0.338*** (0.0723)	0.335*** (0.0727)		0.103 (0.0727)	0.116 (0.0725)
Number of children aged 0-2 in household			0.0272 (0.143)			-0.195 (0.186)			0.298 (0.219)
Number of children aged 3-6 in household			-0.0337 (0.121)			-0.0322 (0.158)			0.0280 (0.184)
Newborn in household (0/1)			-0.123 (0.121)			0.164 (0.153)			-0.489** (0.194)
School aged child in household (0/1)			0.341 (0.262)			0.581* (0.334)			-0.187 (0.410)
Federal State FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	1068	1068	1068	582	582	582	486	486	486
Individuals	534	534	534	291	291	291	243	243	243

*Notes:* Panel regressions with individual fixed effects. Sample comprises the parents of children aged 0-6 (excluding children in school). Dependent Variable: *Social Integration Index s\** (principal component analysis of the variables included in Table 2). Standard errors clustered by counties in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . *Source:* IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

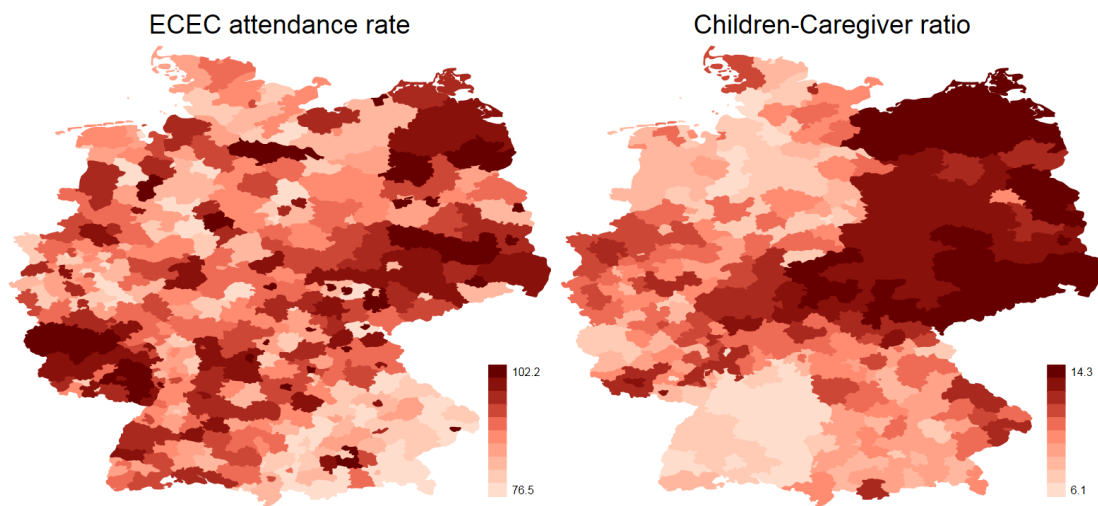
Table S11: Relationship between number of asylum seekers, ECEC supply and county characteristics

	(1) Asylum seekers	(2) A.S. under 7	(3) ECEC Supply
East-Germany (0/1)	282.7 (1746.4)	16.49 (19.42)	4.327*** (0.279)
Urban district (0/1)	-3248.4*** (753.5)	-3.894 (17.08)	0.446** (0.202)
Unemployment rate	226.2 (141.2)	1.025 (2.759)	-0.00153 (0.0416)
County share of center-right-wing voters	-8812.4*** (2828.1)	84.44 (62.44)	-1.373 (1.103)
Employment rate women	-81.10 (94.28)	-2.714** (1.207)	0.0190 (0.0177)
Residents under 6 years	964.1*** (319.5)	-4.989 (10.91)	-0.410** (0.173)
Household income	-0.283 (0.880)	0.00832 (0.0264)	0.000152 (0.000401)
Tax income	1.520* (0.847)	-0.0458* (0.0275)	0.000525* (0.000289)
Population density	1.721*** (0.595)	-0.0157 (0.00968)	-0.000220** (0.0000905)
New Asylum Seekers (2013-2016)		0.126*** (0.00342)	0.000109 (0.0000969)
New A.S. under 7 (2013-2016)			-0.000879 (0.000674)
People beginning integr.course			-0.00222 (0.00383)
Integr.course graduates			0.000401 (0.000642)
Asylum seeker characteristics			
Average age			0.00319 (0.0138)
Share of single parents			0.216 (0.345)
Average years in Germany			0.161 (0.176)
Share with no schooling			0.302 (0.215)
Share of people from Syria			-0.248 (0.233)
Share of people in group accomodation			-0.0158 (0.222)
Observations	392	389	201
Adjusted R <sup>2</sup>	0.337	0.972	0.870

*Notes:* In column (1) the dependent variable is the number of asylum seekers residing in the country, while in (2) the number of asylum seekers under the age of seven. In column (3) the dependent variable is the ECEC supply score, i.e. the instrument, at the county level. Standard errors clustered by counties in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . *Sources:* Destatis, INKAR, AZR, IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

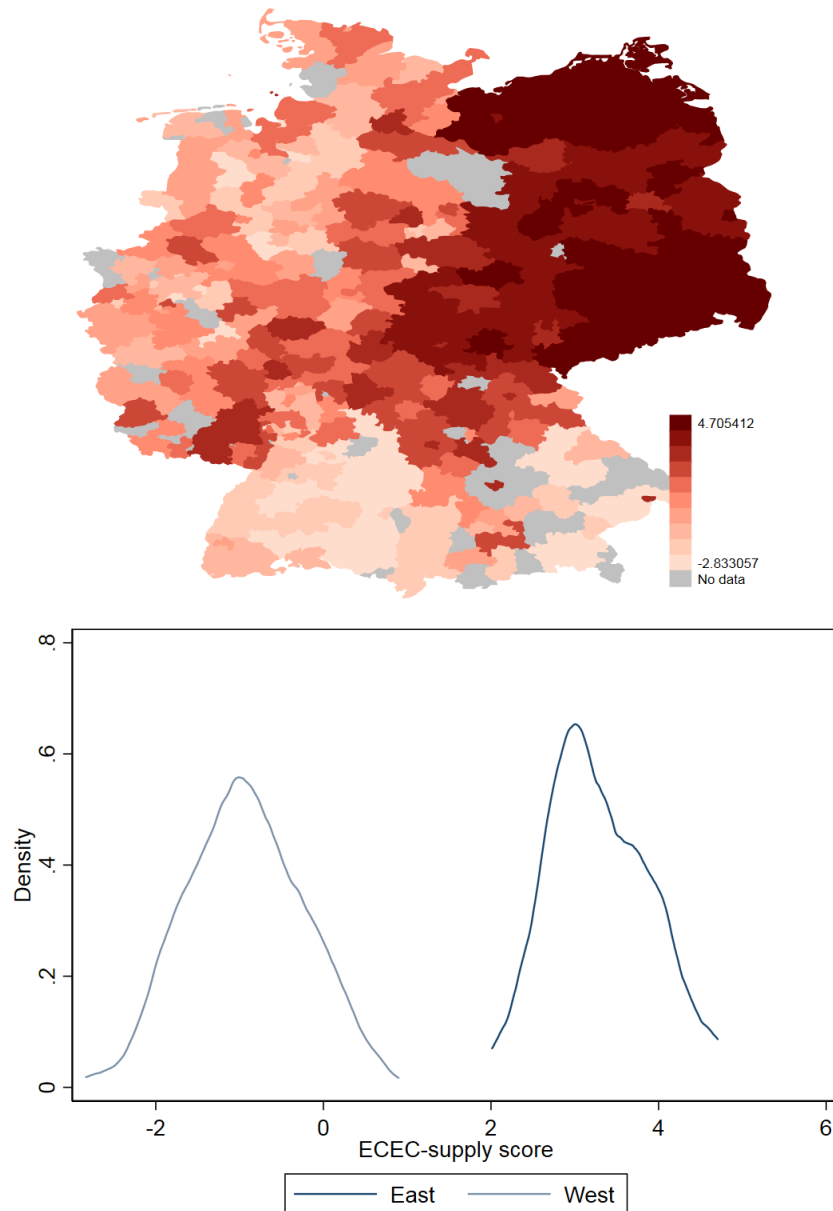


Figure S1: Local variation in ECEC attendance and supply



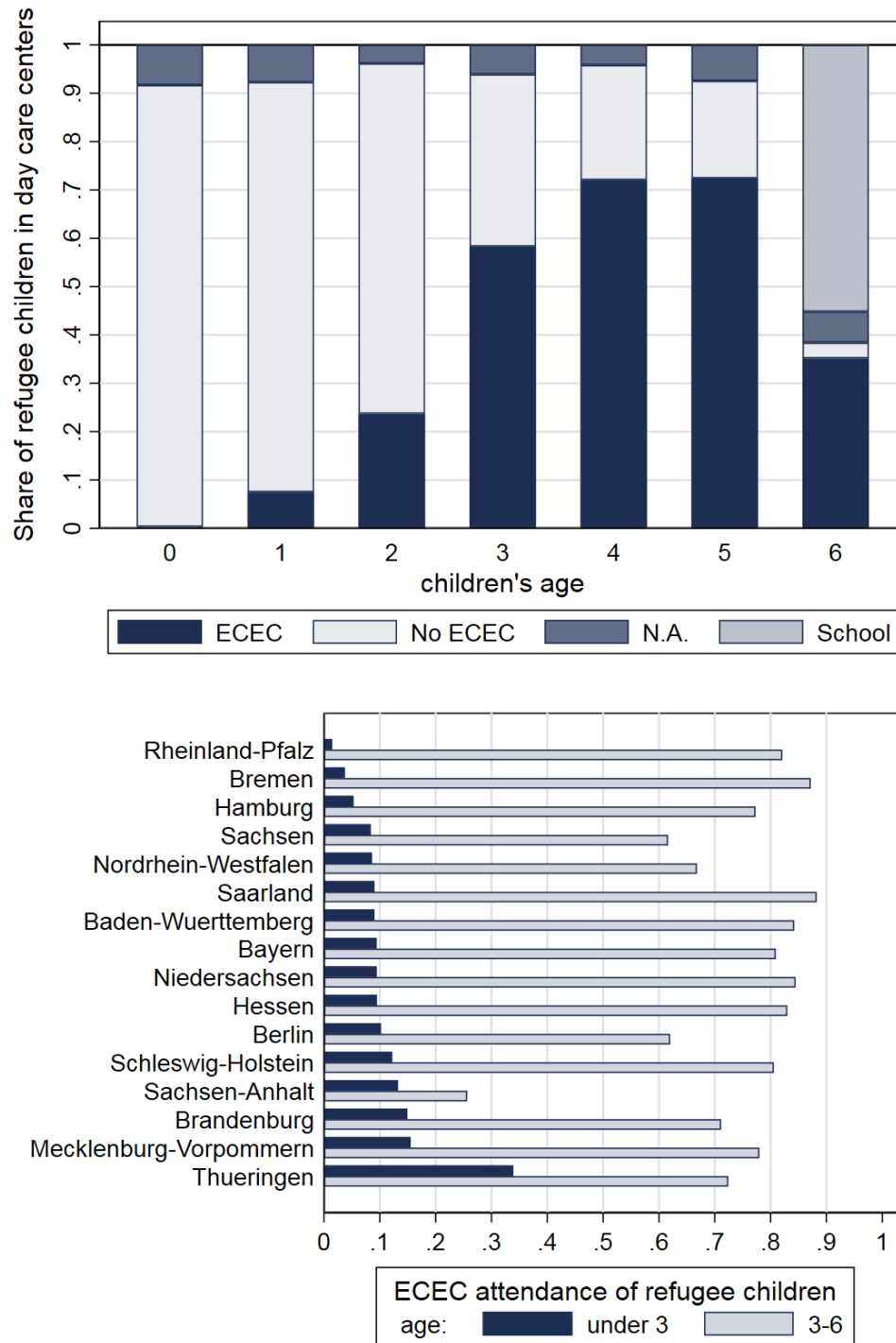
*Notes:* Both measures for 3-5 years old. *Source:* Own elaboration, data from INKAR 2015 and Early-Childhood-Education-Monitor 2016 (Bertelsmann Foundation).

Figure S2: Variation of ECEC-supply score  
ECEC-supply score



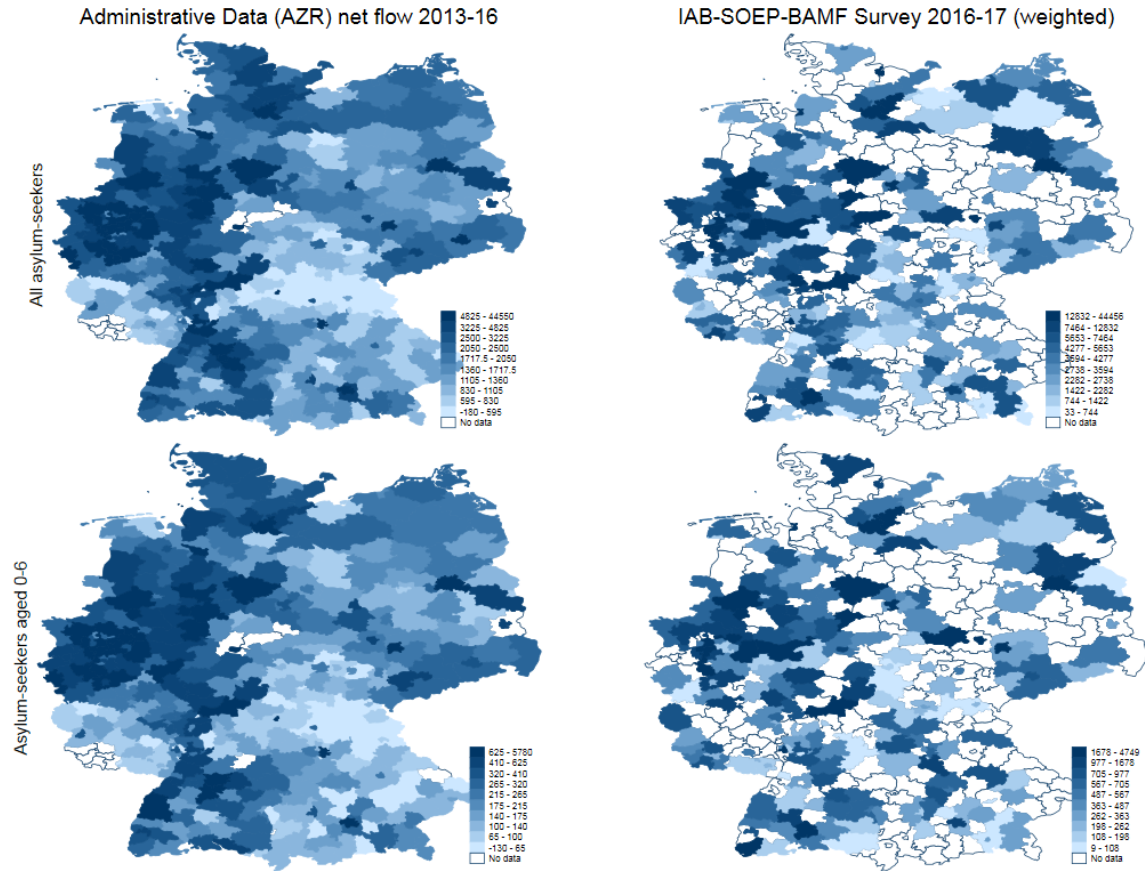
*Notes:* Map shows the local variation of the ECEC-supply score (i.e. the instrument). Graphs show its density functions for East and West Germany. *Source:* Own elaboration, data from INKAR 2015 and Early-Childhood-Education-Monitor 2016 (Bertelsmann Foundation).

Figure S3: ECEC attendance of refugee children



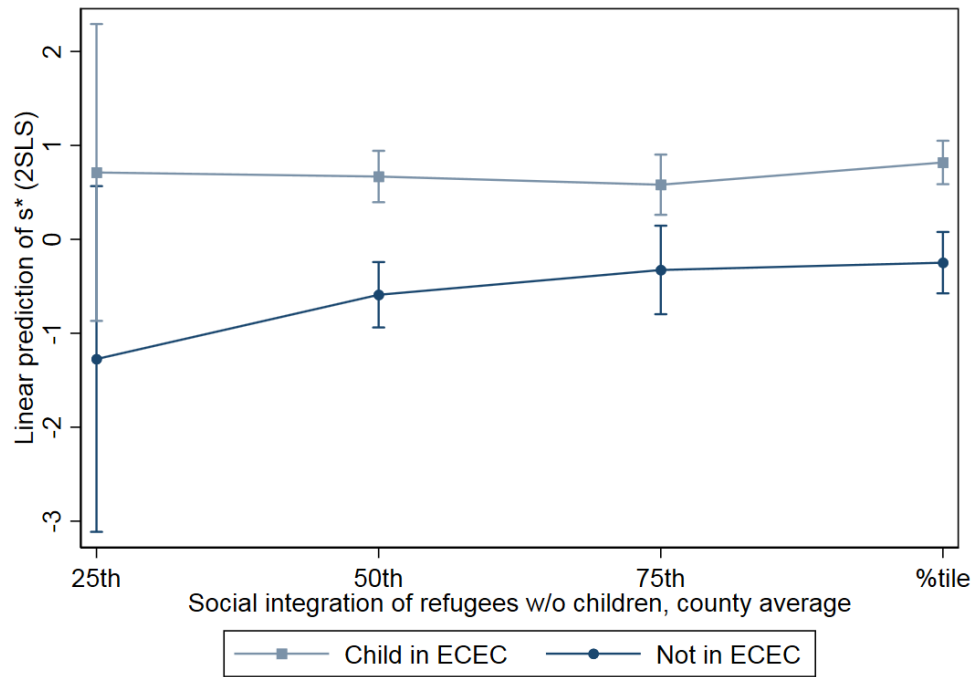
Source: IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations. Weighted shares.

Figure S4: Geographical distribution of refugees



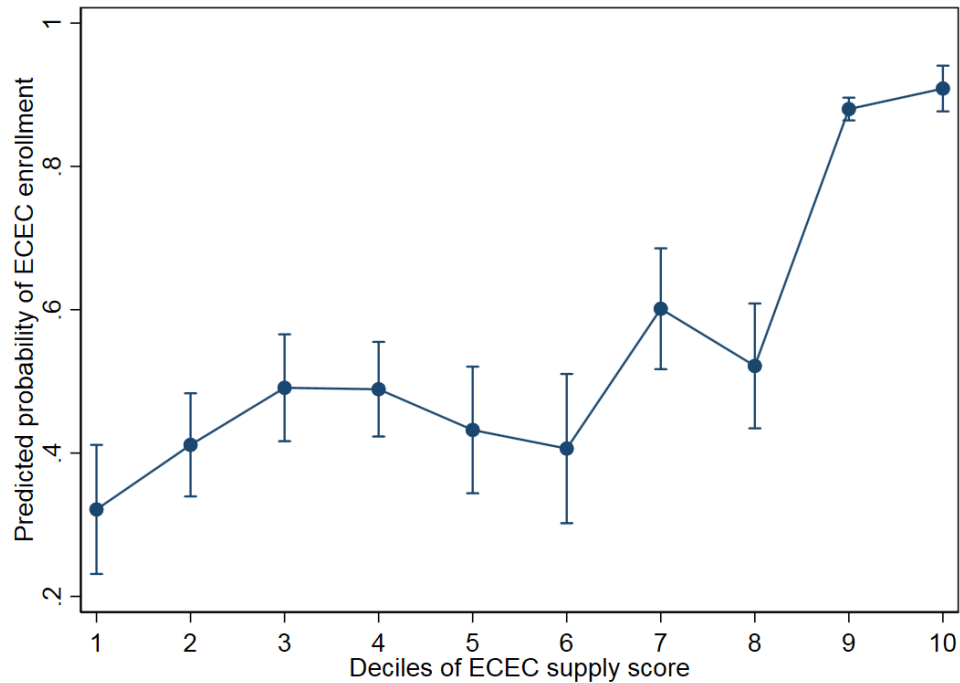
Source: Administrative Data (Central Register of Foreigners; AZR, Destatis) and IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own elaborations.

Figure S5: *Social integration index*: Linear prediction of interaction between ECEC and average social integration of refugees w/o children (2SLS)



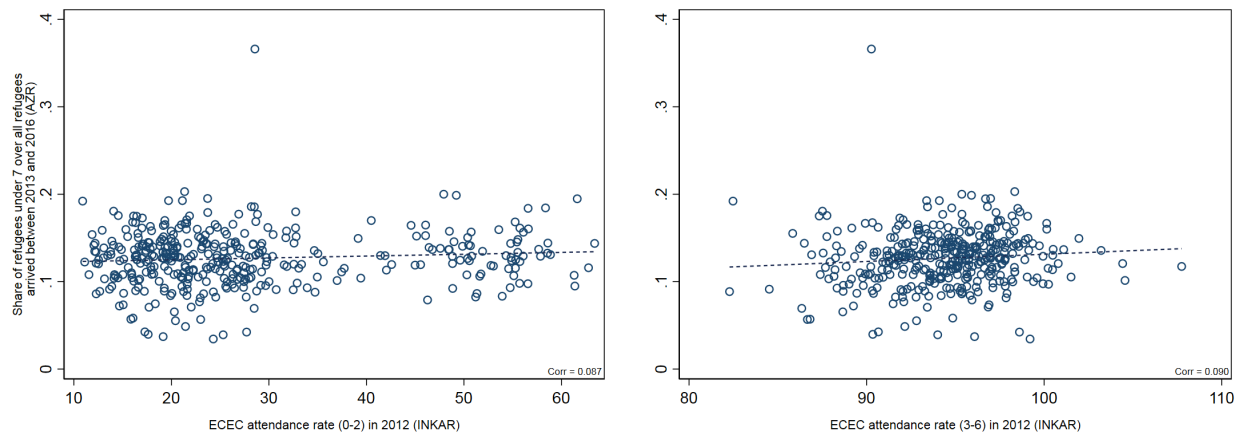
*Notes:* Dependent Variable: *Social Integration Index*  $s^*$  (principal component analysis of the variables included in Table 2). Point estimates of the 2SLS regression (IV is the ECEC supply score). Included control variables are the same as in Table 3 column (4). Confidence interval shown at 90%. Standard errors clustered by counties in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . *Source:* IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

Figure S6: Probability of ECEC enrollment by county ECEC supply



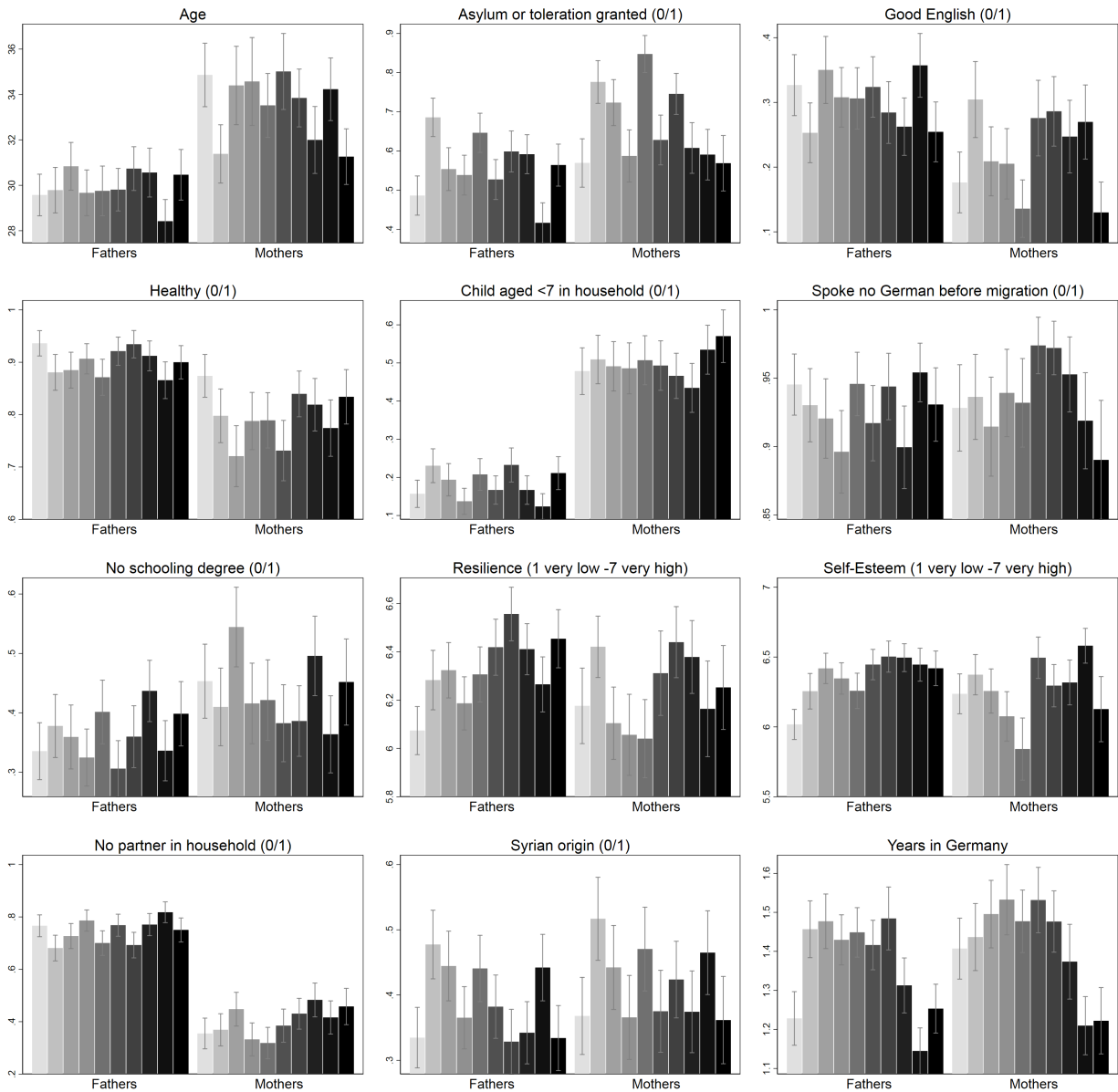
*Notes:* Marginal effects of Probit regression. Dependent Variable: At least one child in ECEC. Included control variables are the same as in Table 4 column (3). Confidence interval shown at 95%. Standard errors clustered by counties in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . *Source:* IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

Figure S7: Relationship between county-level ECEC attendance rates in 2012 and flow of refugee children 2013-2016



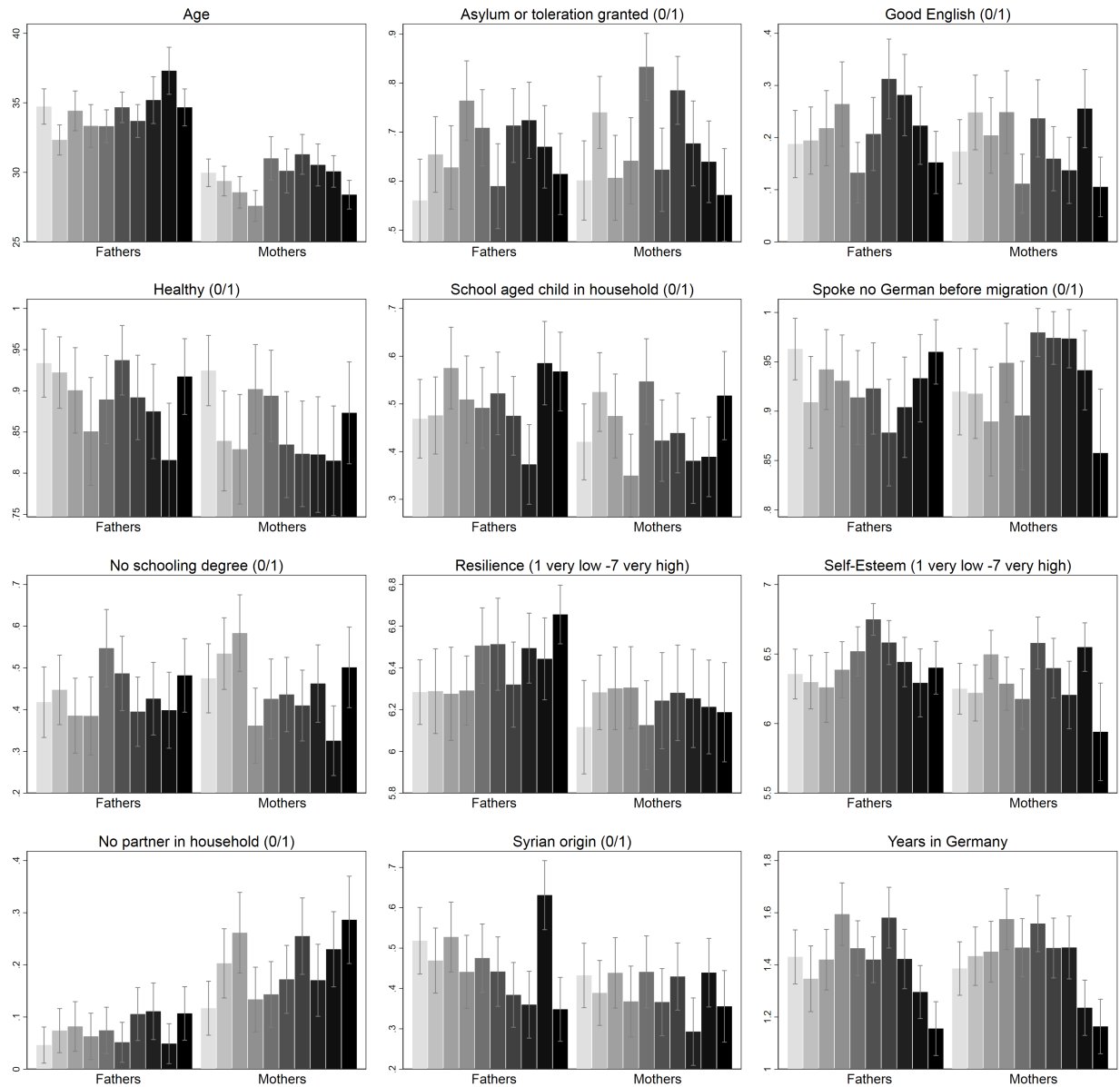
*Source:* Administrative Data (Central Register of Foreigners; AZR, Destatis) and INKAR, own elaboration.

Figure S8: Balancing Test: Average characteristics of resident refugees over the distribution of ECEC supply



*Notes:* Sample includes all refugees. Bars show averages of the variables for each decile of the distribution of the county ECEC supply score. Confidence interval set at 95%. *Source:* IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

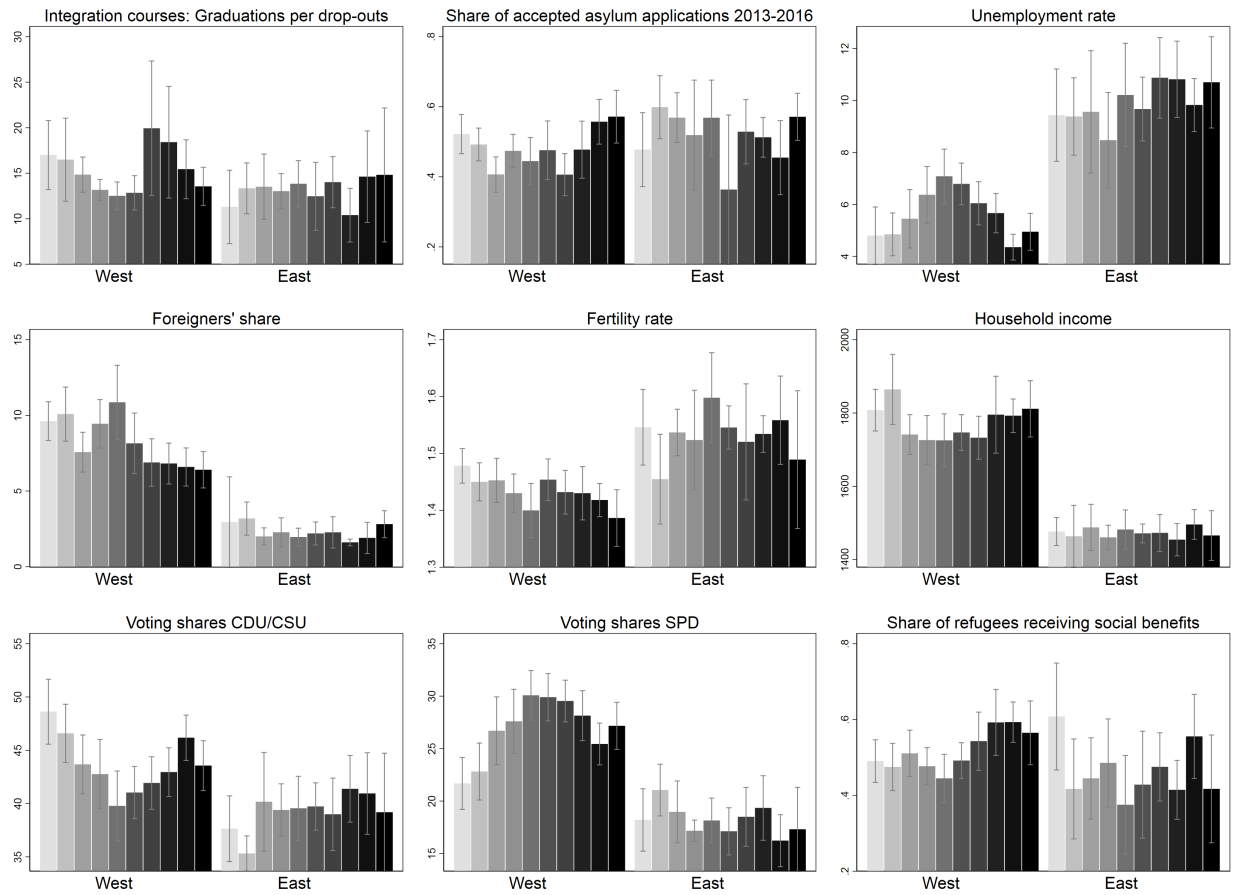
Figure S9: Balancing Test: Average characteristics of resident refugees with small children over the distribution of ECEC supply



*Notes:* Sample includes all refugees with small children (aged 0-6) in household. Bars show averages of the variables for each decile of the distribution of the county ECEC supply score. Confidence interval set at 95%. *Source:* IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.

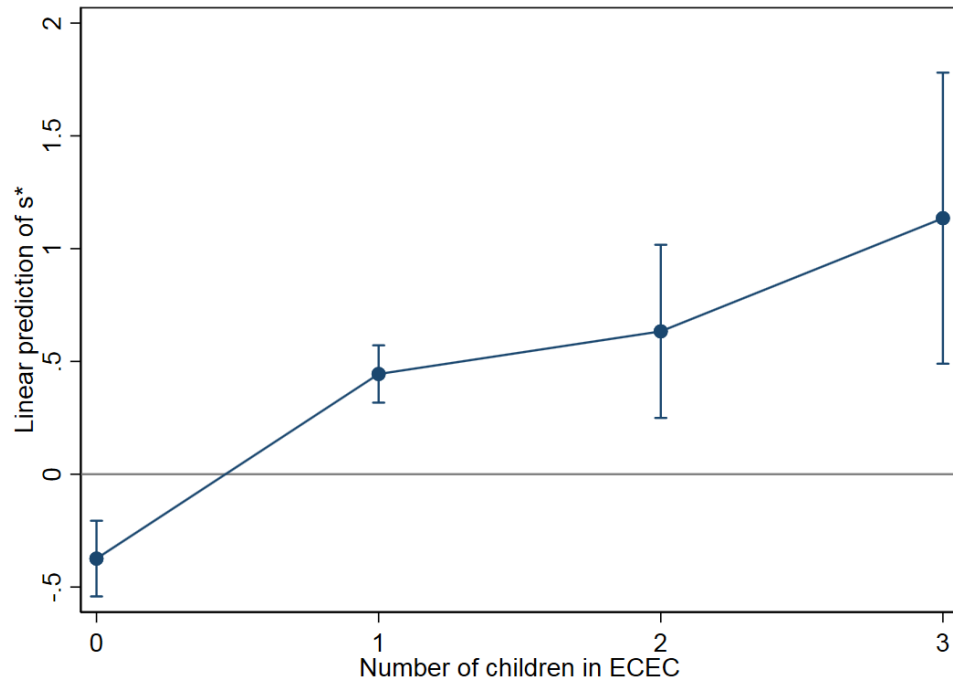


Figure S10: Balancing Test: Average aggregate characteristics of counties over the distribution of ECEC supply



*Notes:* Sample includes all 401 German counties in East and West Germany. Bars show averages of aggregate statistics for each decile of the distribution of the county ECEC supply score. Confidence interval set at 95%. *Source:* Official Statistics provided by Destatis, AZR, Bertelsmann Foundation, INKAR, BAMF-Integrationskursstatistik; own estimations.

Figure S11: *Social integration index*: Linear prediction of social integration by the number of children in ECEC



*Notes:* Dependent Variable: *Social Integration Index  $s^*$*  (principal component analysis of the variables included in Table 2). Included control variables are the same as in Table 4 column (3). Number of children in ECEC included as dummy variables. Confidence interval shown at 95 %. One single family with four children in ECEC excluded from the analysis. Standard errors clustered by counties in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . *Source:* IAB-BAMF-SOEP Survey of Refugees in Germany 2016 and 2017 (SOEPv34), own estimations.



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