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Refugee migration, labor demand, and local employment*

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Abstract

Whether or not immigration negatively affects the labor market outcomes of natives is an ongoing debate. One of the challenges for empirical evidence is the simultaneity of supply- and demand-side effects. To isolate the demand side, we focus on recent refugees in Germany who are exogenously allocated to districts and largely excluded from the labor market. Using panel data of all German districts between 2010 and 2018 and leveraging variation in the local stock of asylum seekers, we find that 1,000 asylum seekers create 267 jobs on average in a district. This growth effect is mainly driven by a demand for additional labor in service, public administration, and social work. As a consequence, we also observe a significant reduction in the local unemployment rate when more refugees arrive. The dynamic panel data estimates are robust to various sensitivity checks and two different instrumental variable approaches. Quantifying the demand side of immigration adds to our understanding of local labor market dynamics in an increasingly mobile world.

Keywords: labor demand; refugee migration; employment growth; unemployment

JEL-Codes: J21, J23, O15, R11

***Address for correspondence:** Daniel Auer, daniel.auer@uni-mannheim.de, University of Mannheim, A5/6 Building B, 68159 Mannheim, Germany, ORCID: 0000-0003-4454-2365. **Acknowledgments:** We thank Paul Bauer, Paul Berbée, Marvin Brinkmann, Johanna Gereke, Jeremy Kuhnle, Johannes Kunz, Daniel Meierrieks, Katrin Sommerfeld, and Nan Zhang for valuable comments. **Disclosure:** No author has any interests to declare.

1 Introduction

There is conflicting evidence as to whether immigration has a detrimental effect on the labor market outcomes of natives (e.g., Borjas et al. 1996 vs. Card 1990). This is not least because of a complex interplay of supply- and demand-side effects and a lack of appropriate data (c.f., Clemens and Hunt 2019). In a typical immigration scenario, immigrants seek employment opportunities and increase local consumption at the same time (d’Albis et al. 2018). In this study, we look at the specific case of refugee migration to Germany, which experienced comparably large inflows in recent years. Between 2010 and 2018, 2,136,950 asylum claims (Eurostat 2021) were filed in Germany, resulting in around 1.8 million protection seekers living there in 2018 (Federal Statistical Office 2021d). Those refugees are often seen as a financial burden. Hummel and Thöne (2016) estimated costs of up to 15,000 Euros per person per year. At the same time, these costs for living and medical care, but also for education, are spent almost exclusively in local markets.

We leverage the fact that asylum seekers are largely excluded from entering the German labor market, in combination with a dispersal policy that allows for some—exogenous—local variation in the number of refugees per resident. This enables us to identify the effect of refugee immigration on local labor demand, unbiased by supply-side effects. Using longitudinal aggregate data on the local refugee population, combined with detailed indicators on economic performance at the district level, we estimate a dynamic panel model to demonstrate that the presence of asylum benefit recipients (i.e., asylum seekers without access to the labor market who receive welfare benefits) is associated with a substantial increase in the local number of employed workers and a lower unemployment rate in the subsequent year.

These findings are robust to a number of sensitivity checks and alternative model specifications. Moreover, we address remaining endogeneity concerns by means of two different instrumental variable approaches: a shift-share IV (c.f., Jaeger et al. 2018) and the Arellano and Bond (1991) estimator. Additional heterogeneity analyses suggest that the positive effect of hosting asylum seekers on employment growth is exclusively driven by the service industry, which is plausible as we can assume that asylum benefit recipients first and foremost spend their welfare assistance on everyday goods and services. However, while the number of jobs related to public services, such as education, certainly increases,

we observe similar employment gains in the private service industry providing consumables and catering. This supports the claim that asylum seeker-induced employment growth is not confined to more bureaucracy and public jobs, but that asylum seekers benefit the local labor market in general.

Our study contributes to the literature on refugee immigration, labor demand, and local employment, presenting a new approach to measuring the effects of immigration on natives' labor market outcomes. By looking at the most vulnerable group of migrants, asylum benefit recipients, we are able to isolate the labor demand effect from the total effect of immigration, which typically also includes the supply side. In doing so, our findings have important implications for quantifying a “clean” demand-side component. Moreover, from a policy perspective, our findings support the position that immigration is less of a burden to the native workforce. In addition, we show that the presence of asylum seekers contributes more to the local employment growth than some established industries.

This paper proceeds as follows: in Section 2, we summarize the main findings of the literature on immigration and its effect on host countries' economies and highlight the simultaneity of labor supply- and demand-side effects as one of the key empirical challenges. Section 3 discusses the institutional background of the allocation and integration of asylum seekers in Germany. In Section 4, we provide information on the data sets we use and explain our identification strategy. In Section 5, we present the main results, additional robustness checks, and two alternative instrumental variable approaches, and shed light on potential effect heterogeneity across years, districts, and industries. Section 6 concludes.

2 Refugee migration and local labor demand

We investigate the effect of asylum seeker inflows on local economic performance across German districts. In doing so, we focus on a specific type of migration that allows us to isolate the demand-side component of an otherwise more complex interplay between supply- and demand-side channels. This is because asylum policy in Germany averts two key confounders of individual migration: self-selection and labor market access.

First, with regard to self-selection, the classical understanding is that people sort them-

selves into countries and specific locations within destination countries that maximize their utility function and that this selection can be modeled using economic indicators, such as earnings differentials, relocation costs, and local returns to skills (e.g., Borjas 1987; Borjas et al. 1992; Chiquiar and Hanson 2005; Glitz 2014; Beerli et al. 2017; Notowidigdo 2020; Abramitzky et al. 2021), or social capital, such as networks (e.g., McKenzie and Rapoport 2010; Kaestner and Malamud 2014). Røed and Schøne (2012), for instance, find substantial within-destination mobility of immigrants depending on regional labor markets in Norway. For refugee migration, this applies to a much lesser extent. While there is some evidence that initial self-selection along human capital still applies in the context of forced migration (e.g., Guichard 2020; Aksoy and Poutvaara 2021), sorting into specific locations within a destination country is restricted in several Western states (e.g., Auer 2018; Azlor et al. 2020), including Germany, where asylum policy regulates the allocation of refugees across regions. In addition, as we will discuss in Section 3 below, subsequent mobility within Germany is severely constrained by law for our population of interest, and impossible in the vast majority of cases. Hence, earnings differentials and variation in the returns to skills cause little concern about endogenous within-destination migration.

Second, immigration is typically investigated from the perspective of a labor supply shock (e.g., Mishan and Needleman 1966; Dustmann et al. 2008), and the hypothesis is that excess labor supply through immigration depresses earnings and increases unemployment among the native population, at least with respect to the (lower-skilled) native workforce that can be substituted by immigrant workers (e.g., Borjas 2003; Mansour 2010; Del Carpio and Wagner 2015; Tumen 2016; Dustmann et al. 2017; Borjas and Monras 2017; Sharpe and Bollinger 2020). However, a large literature finds no such adverse effects of immigration on native labor market outcomes (e.g., Card 1990; Altonji and Card 1991; Friedberg and Hunt 1995; Card 2005; Bonin 2005; Peri 2011; Basso and Peri 2015; Carrasco et al. 2008). While labor market policies such as minimum wages and strong labor unions seem to mitigate negative effects on (low-skilled) native workers (e.g., Glitz 2012; Edo and Rapoport 2019), a main reason for the absence of such negative effects of immigration is that migrants not only constitute an additional workforce but also accelerate the demand for everyday goods and services. Hercowitz and Yashiv (2002), for instance, show that mass migration from the USSR to Israel in the 1990s negatively affected native employment only after one year. The authors explain this lagged effect with a positive

impact of immigration on the excess demand for goods in the short run (see also Friedberg 2001, who finds no adverse effect of USSR–Israel migration on native wage growth and employment). Similarly, Rhode (2003) explains the rapid increase of wages in California after World War II by the growth of local retail and housing markets through immigration. Dustmann et al. (2005) apply a shift-share instrumental variable approach using UK data and find that immigrants do not seem to replace native workers—despite their remarkably close skill composition. A similar approach has been chosen by Basten and Siegenthaler (2019), who use an instrumental variable approach to address endogenous immigration. They find that foreign workers in Switzerland reduced unemployment among the resident population and only marginally depressed their wages. They explain those effects with younger resident workers switching to more demanding jobs in response to immigration (c.f., Ortega and Verdugo 2014 and Beerli et al. 2021 for similar findings on the promotion of native workers). Recently, Howard (2020) investigated domestic migration in the USA, showing that increased construction and non-tradable consumption outweigh increased labor supply, and Hong and McLaren (2015) studied the effects of immigration on local labor demand using a 20-year sample of the US census. They find that one immigrant creates almost 1.2 jobs, thus overcompensating supply-side effects.

Importantly, these studies still look at the total effect of immigration, changing both supply and demand for labor. That is, they explain the absence of negative supply-side effects on natives by an increased demand for labor by the immigrants themselves. Bodvarsson and Van den Berg (2006) summarize this simultaneity bias, arguing that research has often ignored the fact that migrants consume locally because, without an exogenous intervention, this demand-side effect is very hard to isolate. For the German case, Brücker and Jahn (2011), for instance, find no changes in unemployment following a substantial increase of the workforce (4%) due to immigration from Eastern European countries. They explain their zero finding by a shift in labor demand that counterbalances the supply side. To circumvent this simultaneity issue, researchers have sought to identify exogenous shifts or policy changes that only affect the demand side. Bodvarsson and Van den Berg (2006) observe an increase in retail wages and housing prices following the opening of a large meatpacking plant in Nebraska that has led to excessive demand—pull immigration of Hispanics who did not immediately enter the labor market. More recently, Taylor et al. (2016) showed that the increase in total real income in the areas surrounding

three refugee camps in Rwanda is about twice as high as the aid the refugees receive. In a similar observational study, Alix-Garcia et al. (2018) observe increased consumption in households located close to a camp in Kenya that hosts more than 180,000 refugees. The authors argue that this positive effect is likely driven by the increased demand for goods by the refugees (and humanitarian workers in the area) in combination with scant employment opportunities for refugees outside the camp.

Here, we arguably provide the cleanest test of the demand-side effects of immigration, as we focus on refugee migration to Germany. Immediately after arrival, this immigrant population is eligible for welfare benefits but at the same time is largely excluded from the labor market, at least as long as their asylum decision is pending (or once they have received a negative decision). This allows us to estimate the effect of immigration on labor demand without bias through supply-side channels. In a related study, Weber and Weigand (2016) find small positive effects of refugee migration to Germany on the country’s macroeconomic performance when instrumenting historic migration flows to Germany with the number of battle-related deaths from conflicts globally. These effects fade out quickly and turn (slightly) negative afterwards. However, the authors apply country-level aggregate data that might be missing important within-country variation on the local level. We advance these findings with fine-grained panel data on local economic performance and leverage variation in the (exogenously allocated) local asylum seeker population across districts. This detailed data enables us to investigate within-district effects of a change in the stock of asylum seekers on local economic performance. We hypothesize that an exogenous increase in labor demand (without changing supply) promotes local employment.

3 Institutional background

Germany ranks among the most popular European destination countries for refugees, especially during 2015/16. In 2015, 36% of all asylum claims in the European Union have been made in Germany (European Parliament 2021). Figure A.1 in the Appendix shows the yearly population of asylum seekers in Germany between 2010 and 2018.

3.1 Spatial allocation of asylum seekers

Allocation across states: A specific key regulates how asylum seekers are distributed across the federal states (Federal Ministry of Justice 2020c). With the goal to ensure an economically fair allocation, the number of asylum seekers depends on the state’s population (1/3) and its total tax income (2/3) relative to the other 15 states in the country. The key is updated yearly and calculated using data from the two previous years. From 2010 to 2018, the resulting shares ranged between 0.9% in Bremen and 21% in Northrhine-Westfalia. However, given that the resident population is changing only slowly and the total local tax income is a function of the number of residents, the shares for each state hardly change over time. For a more detailed discussion of the asylum allocation in Germany, see Federal Office for Migration and Refugees (2021b). Asylum seekers who arrive in Germany are randomly allocated to a federal state. Individual characteristics—apart from family reunification—are not considered. In combination with the fact that the federal authorities decide on the asylum application, this rules out that our measure of the local stock of asylum seekers is biased by a differential composition or differential speed in the asylum process across districts—our unit of investigation.

Allocation within states: Asylum seekers are initially accommodated in reception centers¹ for 6 weeks to at most 6 months², before they are further assigned to a specific district within the federal state (Federal Ministry of Justice 2021c). In that district, refugee accommodation is provided in the form of communal accommodation or apartments. Importantly, independent of the housing arrangement, asylum seekers are required to reside in the assigned location as long as they receive welfare benefits.³

Federal states assign asylum seekers by quotas based on the districts’ population (Table A.2 in the Appendix provides a list with corresponding regulations). Hence, the expected share a district receives of all newly arriving asylum seekers that are assigned to the district’s state is stable over time—similar to the distribution across states. Because allocation does not take individual characteristics into account and because the asylum

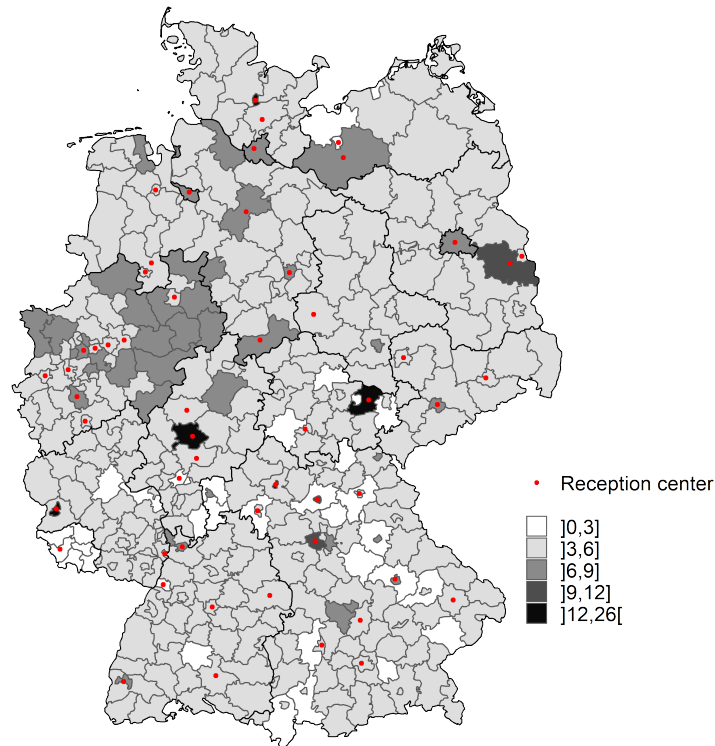
1. In these reception centers, all necessary stakeholders are present, including reception facilities of the state, the Federal Office for Migration and Refugees, foreign authorities, administrative courts, youth welfare offices, and the Federal Employment Agency.

2. Regulations changed between 2010 and 2018: from 2010 to 2014 the maximum time was 3 months while it was 6 months from 2015 to 2018 (Federal Ministry of Justice 2021b)

3. Until 2016, accepted refugees, i.e., asylum seekers with a positive asylum decision, could move before the end of the three-year period.

decision is made by federal authorities, the speed of transition from the asylum seeker status to accepted refugee or to a negative decision (and eventual deportation) should be equal across districts. That means that the local stock of asylum seekers is defined as the population’s proportional share of asylum seekers that enter Germany in a given year plus the number of previously allocated asylum seekers who have not yet had a status change.

Figure 1: DISTRIBUTION OF ASYLUM SEEKERS

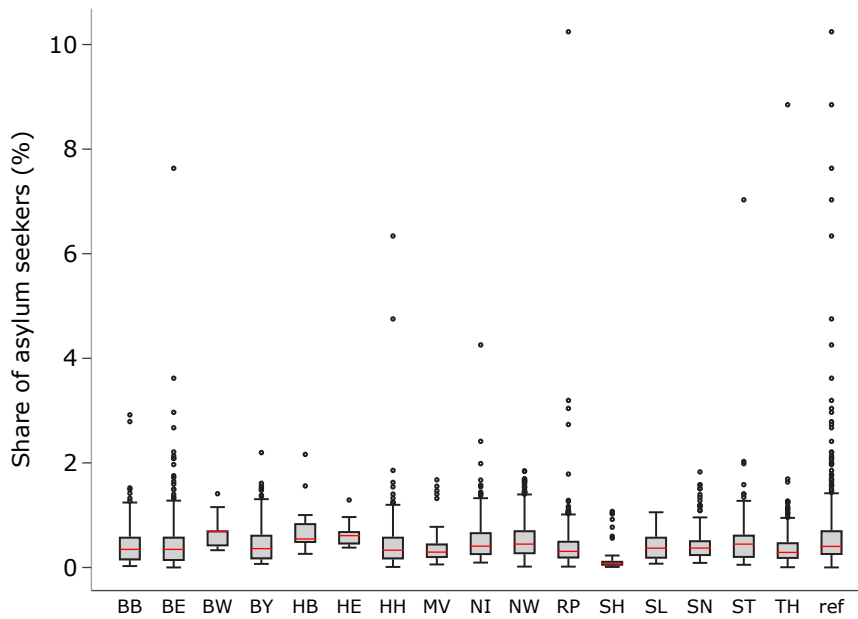


Note: This map shows the distribution of asylum seekers per 1,000 residents across districts (NUTS-3 level, 2010–2018). Shown are asylum seekers receiving welfare benefits. For this group, which covers 98% of the total asylum seeker population, the most accurate spatial data is available (Federal Office for Building and Regional Planning 2020). Red dots indicate locations of the Federal Office for Migration and Refugees (BAMF), i.e., reception centers and branches where asylum requests are processed. On average, a district hosts 996 asylum seekers, which corresponds to approximately 0.5% of the resident population.

Local variation: We confirm the equal distribution at the district level in Map 1, showing that the share of asylum benefit recipients relative to the districts’ resident population is roughly 0.5% in every state. However, considerable variation remains. The main reason for outlier districts that host disproportionately more (or fewer) asylum seekers is that regulations in all federal states allow for deviations from the target shares for certain reasons or to ensure public safety and order. The main reason is available housing. In addition, state authorities operate several refugee reception centers (65 as of 2020, Federal

Office for Migration and Refugees 2021a).⁴ The presence of a reception center strongly correlates with a higher number of asylum seekers in the respective district. This is shown in Column "ref" in Figure 2, in which we plot the variation in the asylum seeker share across federal states. The outlier districts across states with exceptionally large shares of asylum seekers relative to the residence population exclusively consist of districts hosting a reception center.⁵ Variation across districts without reception centers still occurs, albeit to a lesser extent.

Figure 2: SHARE OF ASYLUM SEEKERS ACROSS STATES



Note: The figure shows that, on average, districts across German states have received a similar number of asylum seekers relative to their population, but variation exists. Shown are asylum seekers receiving welfare benefits. For this group, which covers 98% of the total asylum seeker population, the most accurate spatial data is available (Federal Office for Building and Regional Planning 2020). Legend: BB = Brandenburg, BE = Berlin, BW = Baden-Württemberg, BY = Bavaria, HB = Bremen, HE = Hesse, HH = Hamburg, MV = Mecklenburg Western Pomerania, NI = Lower Saxony, NW = Northrhine Westfalia, RP = Rhineland Palatinate, SH = Schleswig-Holstein, SL = Saarland, SN = Saxony, ST = Saxony Anhalt, TH = Thuringia. "ref" = districts hosting a refugee reception center.

Importantly, these (exogenous) deviations from the expected share allow us to estimate the effect of the influx of asylum seekers on local employment. They also highlight, however, that allocation across districts is not fully proportional to the local resident population but varies with the availability of housing and possibly related infrastructure (e.g., local

4. We take the operating reception centers as of 2020; the number might have changed slightly during our observation period.

5. Note that the average share of asylum seekers in reception center districts is still similar to the rest because until 2015 Germany hosted significantly fewer refugees. Moreover, not all reception centers were operating before 2015/16.

administrative capacities). Therefore, we apply a panel model that accounts for between-district variation, which may be correlated with both the probability to receive (more) asylum seekers and economic performance. The obligation for asylum seekers to reside in the allocated district inhibits sorting, which would bias our results.⁶

Another aspect that would produce biased estimates of the relationship between local variation in the stock of asylum seekers and economic performance concerns possible selection into migration to Germany and to locations within the country. That is, our results would be confounded if the number of people who seek asylum correlated with Germany’s economic performance (a claim sometimes made in the context of the 2015 refugee migration) and/or if the allocation of asylum seekers across districts correlated with the local economy. We address this endogeneity concern in Section 5.1 by testing whether a district’s past economic performance predicts the stock of asylum seekers and by applying a Bartik-style instrumental variable approach (Goldsmith-Pinkham et al. 2020) that is widely used in the economic literature on migration (c.f. Jaeger et al. 2018).

3.2 Welfare benefits and labor market participation

Our study investigates the local presence of persons in an ongoing asylum procedure⁷ or who are tolerated⁸ and who are not working, such that they receive so-called asylum seeker standard benefits. We focus on this group—which we label “asylum seekers” for simplicity—because, first, they cover about 98% of the total asylum seeker population (c.f. Section 5.1), and, second, the strictest employment regulations apply to them. In doing so, we ensure the cleanest available measure of a labor demand shock. If those asylum seekers did not face major employment restrictions, our estimates could be biased by labor supply effects. Although some studies have found little competition for jobs between refugees and natives due to lower or incompatible human capital of refugees (Foged and Peri 2016; Clemens and Hunt 2019), the local economy might still be affected by refugees working in large numbers. Brücker, Croisier, et al. (2019) estimate that an asylum seeker in the

6. Cadena and Kovak (2016), for instance, have shown that location choices of Mexican immigrants to the USA respond strongly to changes in local labor demand.

7. Between 2015 and 2018, the average asylum procedure lasted 8.4 months (German Bundestag 2018).

8. Tolerated are persons with a negative asylum decision but who are temporarily suspended from deportation to their country of origin, e.g., because of war in the home country or their individual condition (Federal Ministry of Justice 2020b).

asylum process has a 12% probability of being employed⁹, which increases to 14% on average for persons whose asylum application has been rejected but who could not be deported to their country of origin (i.e., tolerated persons).¹⁰ In Section 5.1, we relax our sample restriction and additionally include admitted refugees with fewer employment restrictions to show that this potential estimation bias remains—if anything—marginal.

In the first three months after arrival, asylum seekers do not have the right to work; after that they can seek permission at the immigration office and move if the employment provides independence of welfare benefits (Federal Ministry of Justice 2021d). Employment opportunities remain restricted, however, to certain branches. Moreover, asylum seekers are not allowed to work while living in a reception center or if they come from a “safe” country of origin (i.e., when this country’s security situation is deemed safe enough for a return). The same applies to tolerated migrants (Federal Ministry of Justice 2020a). After four years of residence in Germany, tolerated migrants can access the labor market without restriction; yet, finding work remains difficult due to their uncertain residence status (e.g., Brücker, Jaschke, et al. 2019).

Anyone who does not work receives asylum welfare benefits and thus is recorded in our data. Hence, it is safe to assume that the persons in our data closely reflect the actual number of asylum seekers present in a district. Asylum welfare benefits are paid partly monetary and partly as benefits in kind. They cover basic necessities such as food, housing and heating, clothing, health care, household goods, and education. The monthly benefit amounts to approximately 670 Euros on average per person, depending on family status and age (Hummel and Thöne 2016).¹¹ Given the fact that welfare benefits for asylum seekers are arguably close to the subsistence level, we expect the largest part of the in-cash benefits to be spent on local goods and services.¹²

9. Persons who are full-time and part-time employed (including self-employed), marginally or irregularly employed, in company-based training or in retraining are considered to be employed here.

10. The longer (admitted) refugees live in Germany, the higher their employment rate: of the refugees who arrived in 2013, only 3% were working within the first year after arrival (which closely corresponds to our aggregate numbers shown in Table A.1 in the Appendix), 17% after two years, and 37% after three years. In 2018, around 5 years after arrival, about 50% of the 2013 cohort were employed (Brücker et al. 2020).

11. A single adult from 2010 to 2018 received between 143 and 135 Euros per month if they lived in a reception center. If they lived in an apartment they received around 354 Euros with rent and heating costs being covered additionally (Federal Ministry of Justice 2021a). Admitted refugees generally receive the same benefit amount as German citizens. These welfare benefits for single adults amount to approximately 742 Euros compared to the 670 Euros for asylum seekers (Federal Ministry of Labour and Social Affairs 2021). For further comparison, students subject to visa obligations in Germany are required to prove monthly resources of 861 Euros (Federal Foreign Office 2021).

12. A study by the Inter-American Development Bank (2004) found that even immigrants from Latin

4 Data and identification

Our data stems from two official sources: the German Statistical Office provides publicly available information on the number of asylum benefit recipients in a district in a given year, detailed economic indicators on (sector-specific) employment, and basic demographic aggregates (Federal Statistical Office 2020a, 2020b). The main analysis uses the number of asylum benefit recipients in a given district (henceforth asylum seekers). As a robustness check, we re-estimate the main model using protection seekers, that is, all persons who reside in Germany on humanitarian grounds (including accepted refugees).¹³ The Federal Office for Building and Regional Planning (2020) further provides earnings and commuting patterns at the district level. Our outcomes of interest capture the local labor market and earnings situation as a reflection of the district’s economic performance. Specifically, we have obtained information on the number of employed workers in a given year (with subcategories on gender, migration background, and industry), the local unemployment rate, and the average annual household income. The data is available for the period 2010–2018, covering all 401 German districts.¹⁴ Summary statistics are reported in Table A.1 in the Appendix. Furthermore, Figure A.1 shows the stock of asylum and protection seekers during our observation period.

We estimate the within-district effect of a change in the stock of asylum seekers on local economic performance with the following panel model:

$$Y_{dt} = \psi Y_{dt-1} + \tau R_{dt-1} + \beta X'_{dt-1} + \lambda_d + \lambda_t + \varepsilon_{dt}, \quad (1)$$

where the different economic outcomes Y (number of employed¹⁵, unemployment rate¹⁶,

America in the U.S., who remit the greatest share of U.S. income back to relatives in Latin America, spent 93 percent of their gross 2003 income of 450 billion in their local communities.

13. Another advantage of the data on asylum benefit recipients is their accuracy. While numbers on migrant stocks (including the data for protection seekers used here) and even on native residents sometimes suffer from reporting issues (e.g., people moving without officially registering), the data on benefit recipients is arguably more accurate because the transfer of federal funds to districts depends on the number of registered persons.

14. We impute missing data on asylum seekers in 12 district-years (0.3% of the sample) with the observation in the previous/subsequent year: six districts have one year missing, three districts have two years missing. We apply the same approach for two missing observations on aggregate household income and 64 observations on sector-specific employment figures. Note that the results do not change when excluding observations with missing data or when excluding the entire district from the sample.

15. The number of employed is defined as all employees subject to social insurance contributions at their place of work. This includes trainees and part-time employees, among others (Federal Statistical Office 2021b).

16. The unemployment rate is defined as the share of unemployed persons among the civilian labor force

household income¹⁷) of district d in year t are a function of the local stock of asylum seekers R and a vector of additional district controls X' in the previous year, and fixed effects for the district and year. We additionally address the dynamic panel structure by including the lagged dependent variable Y , thus allowing for the modelling of a partial adjustment mechanism. Because the record date for employment outcomes (June 30) differs from the one for asylum seekers (December 31), our default outcome is the economic performance in the subsequent year. As described in Section 3.1, the within-state allocation depends on the district’s resident population relative to the other districts in the respective federal state. To account for the fact that larger districts receive more asylum seekers, we adjust for the districts’ population in $t - 1$. Additionally, we capture urban–rural differences with the districts’ population density and account for demographic differences with the average age of the local resident population and the share of foreigners. We include additional controls and investigate spillover effects in Section 5.1 below.

4.1 Endogenous allocation

Given that the allocation of asylum seekers to districts within a federal state is proportional to the local resident population by law, we would not expect the economic performance of a district to affect the future allocation of asylum seekers. However, it could be that our estimates are biased because the size of the allocated shares is still endogenous. Regional politicians could be inclined to bend regulations, manipulate local housing availability, and assign asylum seekers so that it suits their constituents and/or electoral goals, for instance, by sending more asylum seekers to economically poorer districts. We therefore assess endogenous allocation with the following model:

$$R_{dt} = \tau Y_{dt-1,2} + \beta X'_{dt-1,2} + \lambda_d + \lambda_t + \varepsilon_{dt}, \quad (2)$$

where the stock of asylum benefit recipients in a district is defined as its past economic performance Y (employed, unemployment rate, household income) 1 and 2 years ago respectively, additional district controls X' (same as in Equation 1), and fixed effects for

in percent (Federal Statistical Office 2021e).

17. Household disposable income is defined as the amount available to households for consumption or savings. It is obtained by adding to the primary income (coming from employment and property) the monetary social benefits (e.g., pension, unemployment benefit, child benefit) and deducting social contributions as well as taxes. (Federal Statistical Office 2021a) We take the log average household income per inhabitant.

the district and year. The results in Table 1 show that the allocation of asylum seekers is uncorrelated with past economic performance. Neither the number of employed persons, the unemployment rate, nor average household income in $t - 1, 2$ affects the number of asylum seekers in t . We can therefore assume that the local economy plays no significant role in the allocation of asylum seekers and that our results are not biased.

Table 1: PAST ECONOMIC PERFORMANCE AND LOCAL STOCK OF ASYLUM SEEKERS

	(1)	(2)	(3)	(4)
Employed persons $_{t-1}$	-0.085 (0.055)			-0.086 (0.056)
Employed persons $_{t-2}$	0.054 (0.043)			0.056 (0.044)
Unemployment rate $_{t-1}$		-0.016 (0.064)		-0.044 (0.060)
Unemployment rate $_{t-2}$		0.025 (0.066)		0.033 (0.067)
Avg. annual HH income $_{t-1}$			-0.498 (1.360)	-0.141 (1.323)
Avg. annual HH income $_{t-2}$			-0.761 (1.254)	-0.531 (1.272)
Population density $_{t-1}$	-0.002 (0.003)	-0.003 (0.003)	-0.003 (0.003)	-0.002 (0.003)
Resident population $_{t-1}$	0.081** (0.038)	0.049** (0.025)	0.049** (0.025)	0.080** (0.038)
Pop. mean age $_{t-1}$	-0.257 (0.185)	-0.331* (0.195)	-0.292 (0.187)	-0.238 (0.210)
Foreign share $_{t-1}$	-0.159*** (0.060)	-0.131** (0.060)	-0.131*** (0.048)	-0.154** (0.067)
Constant	0.947 (11.547)	8.282 (11.667)	19.013 (12.750)	6.859 (12.606)
Observations	2,807	2,807	2,807	2,807
District FE	401	401	401	401
Year FE	7	7	7	7

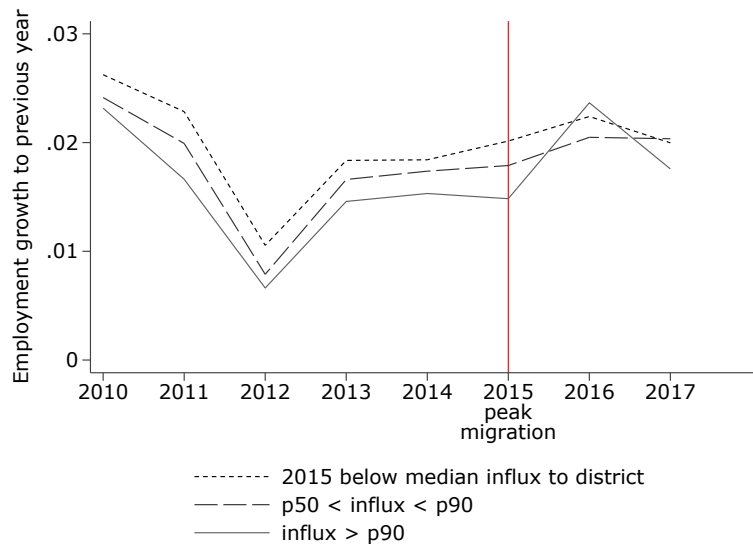
Notes: The table estimates the relationship between past indicators of a district's economic performance (1- and 2-year lags) and the number of asylum seekers in t using a static OLS specification. Robust SE in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

5 Results

Before we turn to the main results of the dynamic panel model, we provide first descriptive evidence on the relationship between the asylum seeker stock and local employment by using the 2015 influx as quasi "on-off" treatment. In 2015, refugee migration to Germany peaked (as in most European countries), with an influx of asylum seekers that by far exceeded previous years (c.f. Figure A.1 in the Appendix). For reasons elaborated above, some districts were arbitrarily allocated more or less asylum seekers in that year. In Figure 3 we plot the average employment growth (change in the total number of jobs

to the previous year) for districts that ended up receiving below-/above-median numbers of asylum seekers in 2015 and for districts that received the highest number of asylum seekers relative to the their resident population (above the 90th percentile in 2015). The descriptive trends show that employment growth across these districts followed parallel trends in most years but that the change of newly created jobs, especially in districts with the largest asylum seeker influx, clearly exceeded that of districts with fewer asylum seekers in the periods after peak migration. This is remarkable, as it seems that the local stock of asylum seekers—which still remained small relative to the local resident population, even in 2015—exerts enough influence on the number of (newly created) jobs to alter the total employment growth patterns in the districts.

Figure 3: EMPLOYMENT GROWTH IN DISTRICTS BY INFLUX IN 2015



Note: The Figure categorizes districts according to the size of the asylum seeker influx in 2015, the peak year of refugee migration in the last decade. The dotted line shows the average growth in employment (total number of jobs) compared to the previous year for districts that were allocated a below-median number of asylum seekers. The dashed line shows the respective job growth for districts with an above-median influx below the 90th percentile. The solid line represents the districts that received the highest number of asylum seekers relative to the their resident population. Note that growth rates are shifted to the left by 0.5 years because the recording date for the number of jobs in the data is June 30.

Table 2 presents our dynamic panel data results estimating the general effect of the local stock of asylum seekers (who are not working and thus receive welfare benefits) on the labor market performance in the subsequent year. As shown in Column 1, the presence of 1,000 asylum seekers is associated with 267 additional jobs in the district and a reduction in the unemployment rate by 0.013 percentage points (Column 2). We do not observe

a statistically significant increase in (log) average household income (Column 3). Note that average annual household income is measured per capita (including residents outside the labor force), so that we would expect the mean to increase with increasing employment.¹⁸ However, the absence of an earnings effect for the entire district’s population is plausible given the relatively small magnitude of the the inflow of 1,000 asylum seekers (on average, a district has more than 200,000 inhabitants, see Table A.1). Columns 4 to 6 provide subsample estimates of the employment effect across demographic groups. While all groups benefit from newly created jobs, the effect is largest for native males.¹⁹ This could be associated with asylum seekers’ increasing demand for specialized services, such as health, or public services related to their asylum process (we return to this in Section 5.4 below). Moreover, the fact that natives also benefit substantially provides evidence that the employment gains are not constrained to the foreign workforce, which may include, for instance, former asylum seekers who are now on the German labor market as foreign residents. In other words, internal dynamics of asylum seekers generating jobs for former asylum seekers cannot explain the overall magnitude of employment gains. At the same time, the positive coefficient for the number of jobs held by foreign workers supports the hypothesis that immigration does not lead to a crowding out of foreign labor, at least if the supply-side channel is contained (e.g., Brücker and Jahn 2011, whereas d’Amuri et al. 2010 find adverse employment effects on previous immigrants). Overall, we infer that more asylum seekers—outside the labor force—in a district significantly increase labor demand, resulting in more hiring and a reduction of local unemployment. As discussed, our panel specification with an extensive set of fixed effects and partial adjustment of the dependent variable make us confident of the proposed mechanism.

18. If income were measured per employed worker, a positive employment effect could even lower the average income if new jobs are created at the lower end of the income distribution.

19. The native coefficient—not shown—is 0.189 compared to 0.140 for foreign workers.

Table 2: EFFECT OF ASYLUM SEEKER PRESENCE ON LOCAL EMPLOYMENT

	(1)	(2)	(3)	(4)	(5)	(6)
	Employed (1,000)	Unemploy- ment (%)	Household inc (log)	Employed (1,000) foreigners	Employed (1,000) males	Employed (1,000) females
Dependent var. $_{t-1}$	1.017*** (0.031)	0.895*** (0.013)	0.514*** (0.046)	1.105*** (0.032)	1.016*** (0.037)	1.005*** (0.026)
Asylum seekers $_{t-1}$	0.267*** (0.091)	-0.013* (0.007)	0.001 (0.000)	0.140*** (0.030)	0.178*** (0.055)	0.097** (0.038)
Population density $_{t-1}$	-0.001 (0.001)	0.001*** (0.000)	-0.000 (0.000)	-0.000* (0.000)	-0.001 (0.001)	-0.000 (0.000)
Resident population $_{t-1}$	0.023 (0.031)	0.001 (0.001)	0.000*** (0.000)	0.005 (0.012)	0.024 (0.021)	0.003 (0.012)
Pop. mean age $_{t-1}$	0.057 (0.139)	0.069** (0.031)	0.013*** (0.002)	-0.014 (0.031)	0.023 (0.090)	0.023 (0.060)
Foreign share $_{t-1}$	0.013 (0.066)	0.016 (0.013)	0.000 (0.001)	-0.012 (0.013)	-0.013 (0.038)	0.016 (0.030)
Constant	-6.514 (8.284)	-3.521** (1.480)	4.239*** (0.417)	-0.427 (2.869)	-5.365 (5.577)	-1.042 (3.312)
Observations	3,208	3,208	3,206	3,208	3,208	3,208
District FE	401	401	401	401	401	401
Year FE	8	8	8	8	8	8
Mean asylum seekers	0.996	0.996	0.996	0.996	0.996	0.996
Mean dependent var.	75.61	6.108	9.924	6.726	40.74	34.87

Notes: The table presents the panel estimations for Equation 1 and different outcomes, allowing for the modeling of a partial adjustment mechanism. Robust SE in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

5.1 Robustness

We assess whether our main findings are sensitive to the sample definition or the inclusion of control variables, and the extent to which spillover effects from neighboring districts occur. In Table A.3 in the Appendix we stepwise include sets of control variables. In Columns (3) and (7), we additionally adjust for the number of in- and outbound commuters to a given district as a measure for the openness of the local economy. The inclusion of endogenous controls that may be affected by the asylum seeker-induced employment gains, such as the number of commuters, may bias our estimates. However, as can be seen, the positive (negative) effect of the asylum seeker stock on the employed (unemployment rate) is insensitive to the inclusion of confounders. In addition, we amend our main specification and adjust for the total number of people in the asylum process in Columns (4) and (8). This data—aggregated at the district level—is obtained from the Federal Statistical Office (2021d) and should be interpreted with care due to reporting issues (people changing their asylum status, leaving the country, or disappearing). Following the recommendations (Federal Statistical Office 2021c), we include all people with a pending asylum process, who are tolerated, or who are obliged to leave the country (negative asylum decision and

pending deportation). Note that this number includes persons who do not receive welfare benefits (e.g., because they are working). According to this definition, a district hosts on average 1,018 persons in the asylum process in a given year between 2010 and 2018 (c.f. Table A.1 in the Appendix). This number is marginally larger than the 996 asylum seekers (persons in the asylum process who receive welfare benefits). Assuming the most extreme case that everyone who does not receive welfare benefits does so because they are employed with a high enough salary would result in an average employment share of less than 3%. This is somewhat lower than the 12% estimated by Brücker, Jaschke, et al. (2019) but plausible given that we only observe one point in time (people may leave employment again before the end of the year). In Figure A.4 we also plot the regression results for the (log) number of possibly employed persons (total number with ongoing asylum process minus welfare recipients) across every district in Germany. The results suggest that labor market integration of persons with a pending asylum process is not only very limited but also relatively homogeneous across districts. The labor market integration of refugees would only be a problem for our identification strategy if it was heterogeneous across districts and if this heterogeneity was correlated with the district’s overall economic performance. If, for instance, asylum seekers found employment in economically better-performing districts, we would likely underestimate the demand-side effect on local employment. Figure A.4 shows that there are hardly any differences across districts in terms of labor market participation, as the vast majority does not significantly deviate from 0. Hence, it is safe to assume that a labor supply shock is, if anything, marginal. In Columns (4) and (8) of Table A.3 we eventually show that controlling for the total number of people in the asylum process does not affect our results.

Table A.4 in the Appendix further shows that the substantive part of the labor demand effect is within districts. This specification accounts for the fact that local economies are usually not confined to single districts and that commuting often runs across district borders. A higher number of asylum seekers in neighboring districts is also associated with more employed (and fewer unemployed) persons in the district of interest, but the coefficients are substantially smaller and statistically significant only for the unemployment rate and the number of employed foreigners.²⁰ We infer that most of the response to a change in local labor demand is local as well.

20. We define neighboring districts as those that share a border with the district of interest and aggregate the number of asylum seekers in these district(s) as well as the neighboring resident population.

In our preferred models, we analyze the effect of the stock of people whose asylum process is still ongoing or who have obtained subsidiary protection (negative decision but security situation in the origin country impedes deportation). In doing so, we explicitly focus on a population that is largely excluded from accessing the labor market to allow for a clean identification of changes in labor demand without interfering labor supply shocks (c.f. Table A.3 for the corresponding robustness check). To assess whether our results are sensitive to this restrictive sample, we replicate Table 2 and replace asylum seekers receiving welfare benefits with protection seekers. The latter groups consists of all people who reside in Germany based on humanitarian grounds irrespective of their legal status (including asylum seekers but also admitted refugees; see Table A.1 for their distribution over time and Figure A.2 across districts). For the latter, employment bans and residence location restrictions are less severe, such that we have to assume that a share of this extended sample has moved to another district (or even state) and that some of them are already working, meaning labor supply shocks might play role. However, the results shown in Table A.5 in the Appendix largely confirm the main pattern and coefficients are only mildly attenuated. This suggests that our findings are stable enough to hold when parts of the residence and employment constraints are relaxed.

5.2 Shift-share instrumental variable approach

Next, we corroborate our results by instrumenting the stock of asylum seekers of a given year with the initial stock (in 2010) in a shift-share approach. The utilization of the (deviation from) past settlement patterns is widely adopted in the economics literature on migration (e.g., Card 2009; see Jaeger et al. 2018 for an overview). We have already shown that the number of local asylum seekers is not associated with the districts' past economic performance (Table 1) and that labor market integration is both marginal (Tables A.1 and A.3) and homogeneous across districts (Figure A.4). Yet, the local stock of asylum seeker welfare recipients might still be endogenous to the local economic performance of a district (e.g., if the local variation in the share of residing asylum seekers is entirely driven by regional authorities assigning more new arrivals to districts in which many asylum seekers find a job). To rule out such feedback between the stock of asylum seekers and local economic performance, we instrument the local stock of asylum seekers in a given year with the initial share in 2010. That is, we define the expected stock of asylum seekers in

a given year as the weighted average of the national stock of asylum seekers, with weights being based on the share of asylum seekers in a given district in 2010. This approach allows us to analyze local variation within districts driven by (less endogenous) changes in the national stock of asylum seekers (c.f., Jaeger et al. 2018).

The results, shown in Table A.6 in the Appendix, corroborate the previous panel estimates. In fact, the coefficients are larger throughout, indicating that we may slightly underestimate the effect sizes in our preferred model with partial adjustment of the dependent variable. Past settlement furthermore has the expected positive effect on subsequent stocks of asylum seekers (also shown in Figure A.5 in the Appendix), and the associated first-stage F statistic surpasses the conventional threshold. We also report the Anderson–Rubin test’s p-values (Anderson and Rubin 1949). With regard to the subsample estimates for the number of employed foreigners, males, and females, the IV approach provides more ambiguous results. However, the Anderson-Rubin test suggests that the instrument might be weak for these subsamples, so that the results should be interpreted with caution.

5.3 Arellano–Bond estimator

Another reason for possible estimation bias in a dynamic panel data setting has been highlighted by Nickell (1981), who demonstrated that the error term might be correlated with the error term (even after including the first differences), especially in a small-T, large-N setting as ours. Arellano and Bond (1991) and Holtz-Eakin et al. (1988) have subsequently shown that efficient estimates can be recovered in a generalized method of moments framework by creating a series of “internal” instruments based on the lagged values of the instrumented variable.

We show the results for the Arellano–Bond estimator in Table A.7 in the Appendix. Again, they confirm our main findings. Although the coefficients for the unemployment rate have turned statistically insignificant, all other results correspond to the main coefficients presented in Table 2, both in terms of effect size and with regard to statistical significance.

5.4 Heterogeneity

Eventually, we assess whether our observed main effects are heterogeneous with regard to different subsample specifications. First, in Section 3, we described that asylum seekers are initially accommodated in one of the federally operated reception centers located across the country before being assigned to a district. Naturally, the share of asylum seekers relative to the local population should be highest in the districts that host such a reception center. In Figure 2 we have shown that the distribution of asylum seekers per capita is very similar across federal states and that all outlier districts that host a disproportionate number also have an operating reception center (in column “ref” we show only districts with a reception center). Hence, it could be that our observed effect of a positive labor demand shock on employment is driven by these outliers. In Table A.8 in the Appendix we therefore exclude the 53 districts with reception centers from the sample and confirm that this is not the case.

Second, in Table A.9 in the Appendix we restrict the observation period to 2010–2014. Germany has experienced the largest inflow of asylum seekers during the often labelled as “refugee crisis” in 2015, with more than 1 million migrants from Syria and other mainly Arabic countries arriving at the country’s borders. We show that our findings are not driven by this exceptional spike in the number of asylum seekers by excluding all post-2014 district–year observations that were exposed. In fact, the point estimates presented in Table A.9 are even larger, suggesting that the effect of asylum seeker–induced labor demand follows a decreasing function, i.e., the positive effects of the marginal asylum seeker diminish with their baseline population.

Third, we assess whether some industries benefit more than others from increased local labor demand. That is, if our results were driven by increased demand for labor because asylum seekers (initially) are only consumers of goods and services, we would expect the positive employment effects to be confined to specific industries (c.f. Labanca 2020). To test for industry-specific heterogeneity, we estimate the effect of the asylum seeker stock on the number of employed persons in a given industry (Federal Statistical Office 2020a).²¹ The results presented in Table 3 confirm that the overall effect is mainly driven by increased employment in the service industry (Column 3). We do not observe any effect

21. Industries are classified as agriculture, production, construction, and different service sectors according to NACE (Eurostat 2008).

on the number of workers in agriculture (Column 1) and in production (manufacturing, construction, etc.; Column 2). We further identify three subgroups within the service industry: public services (including education, public administration, and social services; Column 4), trade (including catering and tourism; Column 5), and culture-, arts-, and entertainment-related services (Column 6). All sub-branches in the service industry experience relatively similar employment gains. This supports the claim that the jobs created are not (only) a result of federal employment programs to process large numbers of asylum seekers (which might be the case for public services), but that the private sector responds to the demand for everyday goods and services. Assuming that—similar to native welfare recipients—consumption patterns of asylum seekers—apart from general public administration and education—are heavy on basic goods and services (food, groceries, clothing, entertainment, etc.), these heterogeneous effects are very plausible.

Table 3: INDUSTRY-SPECIFIC EMPLOYMENT EFFECTS

	(1)	(2)	(3)	(4)	(5)	(6)
	Agri- culture	Pro- duction	Service total	public	Service trade	culture
Asylum seekers _{t-1}	-0.000 (0.001)	-0.019 (0.014)	0.285*** (0.022)	0.102*** (0.010)	0.131*** (0.010)	0.045*** (0.004)
Observations	3,176	3,103	3,208	3,208	3,208	3,208
District X	yes	yes	yes	yes	yes	yes
District FE	401	401	401	401	401	401
Year FE	8	8	8	8	8	8
Mean asylum seekers	0.996	0.996	0.996	0.996	0.996	0.996
Mean dependent var.	0.601	22.24	52.92	16.81	17.87	2.83

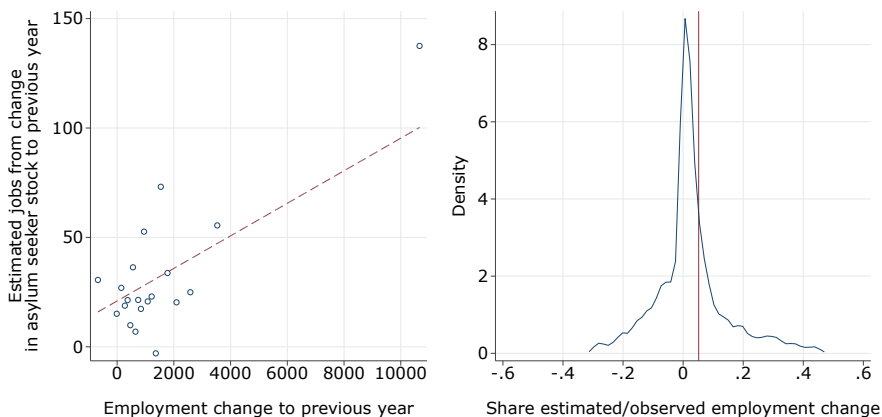
Notes: The table presents the effect of the presence of asylum seekers (in 1,000) on employed residents in the district across sectors. *Model 1:* Agriculture; *Model 2:* Production (manufacturing, mining, water supply, electricity, construction, etc.); *Model 3:* Service (total); *Model 4:* Public administration, education, social services; *Model 5:* Trade, catering, tourism, etc.; *Model 6:* Culture-, arts-, and entertainment-related services. Robust SE in parentheses. * p < 0.10; ** p < 0.05; *** p < 0.01.

5.5 Local employment growth

Lastly, we approximate the relative importance of asylum seeker-induced employment gains compared to the overall employment growth in the German economy. As a back-of-the-envelope calculation, we simply plot the number of expected created jobs due to the change in the stock of asylum seekers within 2 years ($[\text{stock}_{t+1} - \text{stock}_t] \times 0.267$, the main coefficient from Table 2) against the observed change in the total number of employed persons ($\text{employed}_{t+1} - \text{employed}_t$), shown in the left-hand panel of Figure 4. Dividing the expected by the observed growth indicates that, on average, 5.1% of a district's change

in employment is “explained” by the change in the stock of asylum seekers. While this number may sound small at first glance, it should be considered a rather large impact given that refugee migration is usually not considered a relevant part of the German economy, yet alone an economic sector. For comparison, the share of jobs created in agriculture relative to the overall growth is less than 1%, and the entire construction sector “explains” approximately 3.7%.

Figure 4: BACK-OF-THE-ENVELOPE EFFECT SIZES



Note: The left panel plots the estimated number of jobs created (destroyed) due to a change in the stock of asylum seekers against the observed total change in employment in a district using the main employment coefficient from Table 2. The right panel shows the distribution of their quotient (Epanechnikov kernel with bandwidth 0.0088). The estimated number of jobs created due to a change in the stock of asylum seekers within two years “explains”, on average (red vertical line in right panel), approx. 5.1% of the entire employment change in the German economy.

6 Conclusion

Many economists have examined the effects of (refugee) migration on labor market outcomes of the native population (e.g., Card 1990; Dustmann et al. 2005; Orrenius and Zavodny 2007; d’Amuri et al. 2010; Glitz 2012; Borjas and Monras 2017). One of the reasons for the mixed evidence these studies produced is the empirical challenge to disentangle labor supply- and demand-side effects, as migrants typically affect both dimensions simultaneously (c.f., Bodvarsson and Van den Berg 2006; Bodvarsson et al. 2008). Little research has been conducted that exclusively focuses on the labor demand side of immigration, as this requires a specific policy setting in which immigrants can generate demand for labor through (local) consumption but are excluded from the labor force at the same time. In this study, we focus on the special case of refugee immigration to Germany,

where asylum seekers—immediately after arrival—are provided with goods and services (housing, medical care, security) and in-cash welfare benefits, while restrictive employment laws—apart from additional hurdles later on, such as a lack of human capital (e.g., Luik et al. 2018), and other factors such as discrimination (e.g., Auer and Fossati 2019)—almost fully exclude them from the labor market.

Applying a dynamic panel data model with a partial adjustment mechanism, we find a substantial positive association between the local stock of asylum seekers with a district’s employment outcomes in the next year. Our effects are not biased by endogenous allocation into under-/over-performing districts in economic terms and are not confined to districts hosting reception centers (where the influx is largest). Moreover, the results are robust to a series of alternative specifications and sample restrictions and corroborated by two instrumental variable approaches.

At the sample mean, approximately 1,000 asylum seekers with welfare benefits resided in a district during our observation period from 2010 to 2018. According to our main results, this number is associated with 267 additional jobs, mainly driven by growth in the service sector. Subsample analyses suggest, however, that this growth is not confined to public services (medical care, local security) and increased bureaucracy (caseworkers for processing asylum claims), but extends also to the private sector. Simultaneously, local unemployment rates decrease with the presence of asylum seekers by approximately 0.2% on average for every 1,000 asylum seekers in the district. These magnitudes are comparable to those found in the small extant literature that focuses on the demand-side channel. Hong and McLaren (2015), for instance, estimate that an immigrant in the U.S. creates 1.2 local jobs on average. Pretending immigrant labor supply to equal 1 would leave 0.2 additional jobs for the local host population, similar to the 0.267 additional jobs in our setting. The comparably larger effect in the case of refugee migration to Germany might be explained by the fact that consumption using in-cash welfare benefits is likely lower than for regular migrants with more resources, but that this might be (over-)compensated by a higher demand for medical care, security, and administrative services. In that sense, it is possible that we estimate an upper bound of the labor demand effect of immigration, assuming a higher demand for special services among refugees.

Our approach using aggregate data on local economic performance of the host population

has the advantage that differences between the districts' host population can be addressed with the panel data. At the same time, any potential endogenous composition of asylum seeker characteristics is of less concern to our specification, as long as the variation of welfare benefit recipients across districts is not driven by local economic performance e.g., due to non-random allocation or post-allocation sorting within the country (e.g., Damm 2009; Auer 2018; Azlor et al. 2020; c.f. Cadena and Kovak 2016 for migrant sorting in response to local labor demand). However, this aggregate approach does not come without limitations. First, we do not have direct information about wages, the length of contracts for the newly created jobs, or whether the employed are working full-time or part-time. Furthermore, we look at refugee migration from a purely short-term economic perspective. That is, long-term effects (when refugees enter the labor market; c.f. Edo 2019) and societal implications, such as attitudes towards immigration and social cohesion (e.g., Deiss-Helbig and Remer 2021), are beyond the scope of this study. It would be interesting to further investigate how increased labor demand influences not only employment but also economic growth in terms of productivity and technological innovation in the long run (e.g., Gandal et al. 2004; Cohen-Goldner and Paserman 2011).

From a policy perspective, our findings support the position that immigration is less of a burden to the native workforce than often claimed. Whether public welfare benefits for asylum seekers are a burden to the country's budget remains to be answered by future research. According to the back-of-the-envelope calculations in this article, doubts are in order, as we find that employment gains driven by the presence of asylum seekers account for approximately 5.1% of the entire employment growth in the German labor market during our observation period.

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Online appendix

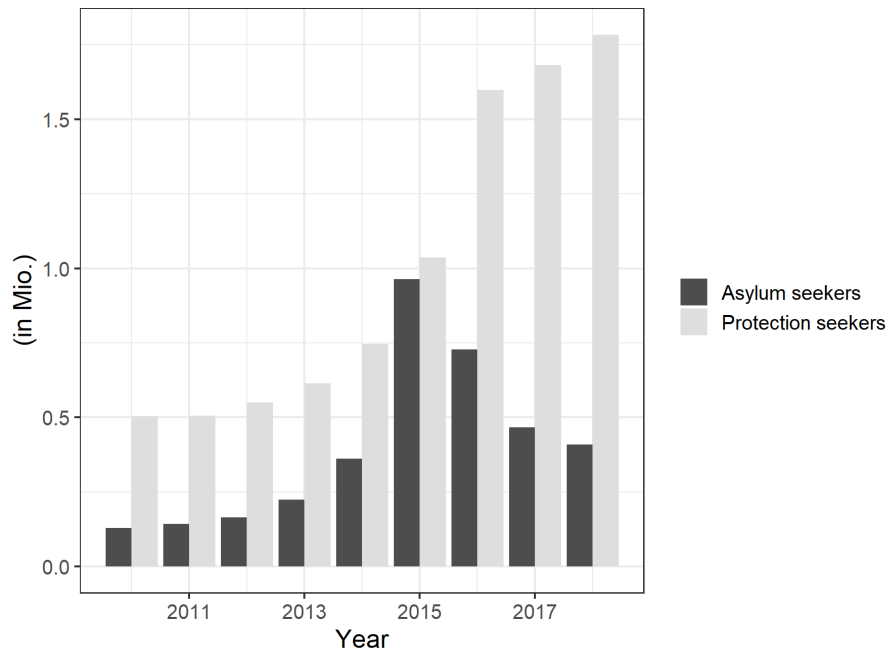
Table A.1: SUMMARY STATISTICS, DISTRICT LEVEL (2010–2018)

	(1)	(2)	(3)	(4)	(5)
	mean	sd	median	min	max
Asylum seekers in district (1,000)	0.996	1.908	0.519	0.001	49.654
Employed persons (1,000)	76.347	103.910	50.482	11.982	1476.248
Unemployment rate (%)	5.965	2.853	5.400	1.200	16.600
Avg. annual household income (log)	9.937	0.124	9.937	9.611	10.512
Employed foreigners (1,000)	6.981	14.148	3.516	0.122	214.115
Employed males (1,000)	41.113	54.216	27.431	5.278	740.142
Employed females (1,000)	35.234	50.002	23.006	6.038	736.106
Population density	525.742	685.787	200.000	36.000	4736.000
Resident population (1,000)	203.679	234.919	149.370	33.944	3644.826
Mean age of resident pop.	44.204	1.881	43.986	38.996	50.214
Foreign share (%)	8.231	4.990	7.400	0.658	35.850
Total asylum process (1,000) [†]	1.018	2.258	0.426	0.001	59.271
Asylum seekers neighboring districts (1,000)	5.801	7.235	3.349	0.000	60.852
Protection seekers neighboring districts (1,000)	27.885	43.981	15.380	0.190	910.504
Population neighboring districts (1,000)	1177.062	842.668	970.661	81.641	4693.875
Districts	401				
Years (2010 – 2018)	9				
Observations	3,609				

Notes: The table presents summary statistics. The recording date for employment outcomes is June 30; the number of asylum and protection seekers is recorded on December 31. [†] Total asylum process captures the number of persons with an ongoing asylum process, who are tolerated, or who are obliged to leave the country, independent of whether they received welfare benefits.

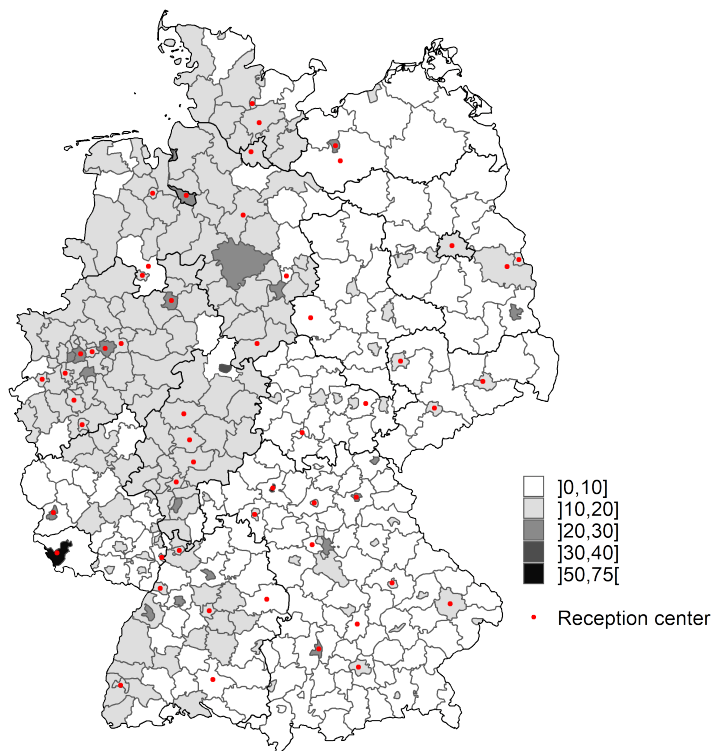
Figure A.1: ASYLUM BENEFIT RECIPIENTS IN GERMANY

Asylum benefits recipients and protection seekers in Germany
2010 - 2018



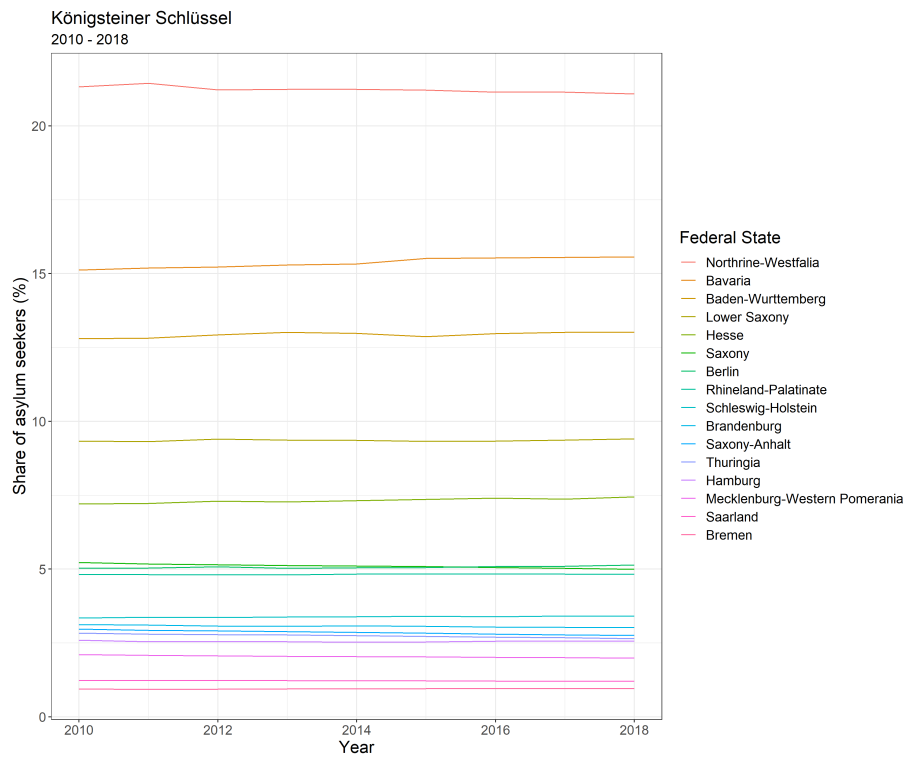
Note: Peak in 2015 for asylum standard benefits recipients. The different trend for the protection seekers can be explained by the fact that the stock of protection seekers continues increasing while some of the asylum standard benefits recipients "wander off" to protection seekers once they are admitted refugees. The number of asylum applicants decreased after 2015, the stock of protection seekers, however, continued to grow because many asylum seekers were granted asylum in 2016.

Figure A.2: DISTRIBUTION OF PROTECTION SEEKERS



Note: Map shows distribution of humanitarian protection seekers across districts (average 2010–2018). Red dots indicate locations of the BAMF, i.e., reception centers and branches in which asylum requests are processed. On average, a district hosts 2,500 protection seekers, approximately 1.1% of the resident population.

Figure A.3: ALLOCATION OF ASYLUM SEEKERS ACROSS STATES



Note: The figure shows the share of all asylum seekers who enter Germany in a given year that is allocated to a state. The allocation key (Königsteiner Schlüssel) is updated yearly. Yet, given that the resident population is only slowly changing and the total local tax income is a function of the number of residents, the shares for each state hardly change over time.

Table A.2: DISTRIBUTION OF PROTECTION SEEKERS ACROSS DISTRICTS

state	quota	law
Baden-Württemberg	resident population	§ 4 Abs. 2 FlüAG
Bavaria	resident population	§ 6,7 DVAsyl
Berlin	one district only	—
Brandenburg	resident population	§ 6 Abs. 4 LAufnG
Bremen	resident population	§ 3 Abs. 3 AufnG Bremen
Hamburg	one district only	—
Hesse	resident population	§ 2 Abs. 1 LAufnG
Mecklenburg Western Pomerania	resident population	§ 3 Abs. 1 ZuwFlüAGDLVO M-V
Lower Saxony	resident population	§ 1 Abs. 1 Satz 2 i.V.m.; § 2 Abs. 1
Northrhine-Westphalia	resident population ¹	§ 1 Abs. 1 i.V.m.; § 3 Abs. 1 FlüAG
Rhineland Palatinate	resident population	§ 2 Abs. 1 Nr. 2 i.V.m.; § 6 Abs. 1 AufnG RP
Saarland	resident population	§ 1 u. 2 LAG
Saxony	resident population	§ 6 Abs. 3 SächsFlüAG; § 2 Abs. 1 u. 2 i.V.m.
Saxony-Anhalt	resident population	§ 1 Abs. 1 u. 3 AufnG ST
Schleswig-Holstein	resident population	§ 1 Abs. 2 LAufnG i.V.m.; § 7 Abs. 1 AuslAufnVO
Thuringia	resident population	§ 2 Abs.1 ThürFlüVErtVO

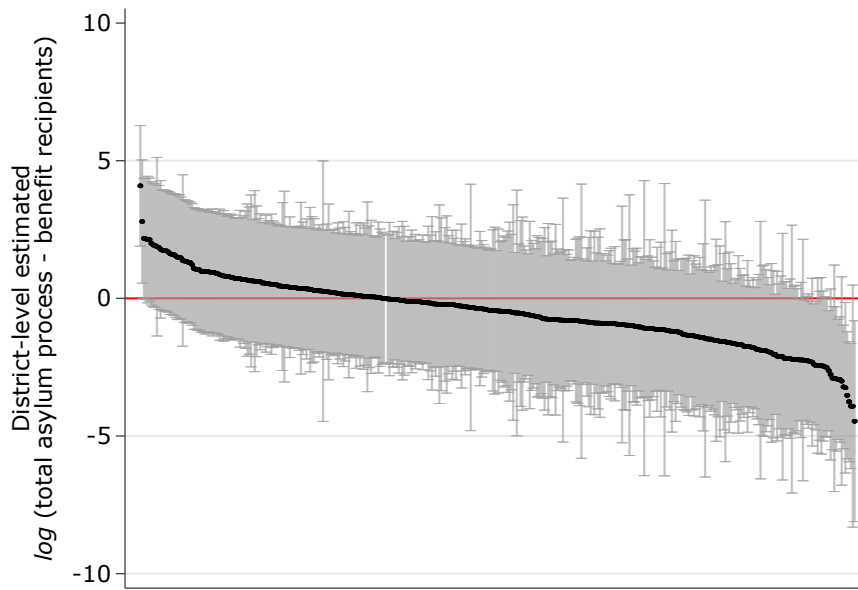
Notes: The table presents the within-state allocation key for asylum seekers. Apart from Berlin and Hamburg (two cities with one district only), all states assign asylum seekers relative to the districts' resident population.¹ In Northrhine-Westphalia, the distribution quota is calculated based on the resident population and the districts' area (ratio 9:1). Hence, the deviation from a population-only distribution is marginal.

Table A.3: ALTERNATIVE CONTROLS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Total employment				Unemployment rate			
Employed persons $_{t-1}$	1.016*** (0.030)	1.017*** (0.031)	1.018*** (0.031)	1.004*** (0.035)				
Unemployment rate $_{t-1}$					0.898*** (0.013)	0.895*** (0.013)	0.884*** (0.013)	0.889*** (0.013)
Asylum seekers $_{t-1}$	0.269*** (0.091)	0.267*** (0.091)	0.265*** (0.091)	0.281*** (0.096)	-0.015** (0.007)	-0.013* (0.007)	-0.014** (0.007)	-0.012* (0.006)
Resident population $_{t-1}$	0.019 (0.028)	0.023 (0.031)	0.022 (0.031)	0.019 (0.031)	0.003** (0.001)	0.001 (0.001)	0.002 (0.001)	0.006*** (0.001)
Population density $_{t-1}$		-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)		0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
Pop. mean age $_{t-1}$		0.057 (0.139)	0.326** (0.142)	0.086 (0.135)		0.069** (0.031)	0.042 (0.036)	0.055* (0.031)
Foreign share $_{t-1}$		0.013 (0.066)	0.017 (0.066)	0.015 (0.066)		0.016 (0.013)	0.016 (0.013)	0.011 (0.013)
Inbound commuters $_{t-1}$			-0.119*** (0.020)				0.032*** (0.008)	
Outbound comm. $_{t-1}$			0.097*** (0.020)				0.010 (0.007)	
Tot. asylum process $_{t-1}^{\dagger}$				0.121 (0.079)				-0.040*** (0.007)
Constant	-3.914 (3.881)	-6.514 (8.284)	-16.994** (8.499)	-6.374 (8.253)	-0.183 (0.231)	-3.521** (1.480)	-4.887*** (1.764)	-3.592** (1.426)
Observations	3,208	3,208	3,208	3,208	3,208	3,208	3,208	3,208
District FE	401	401	401	401	401	401	401	401
Year FE	8	8	8	8	8	8	8	8
Mean asylum seekers	0.996	0.996	0.996	0.996	0.996	0.996	0.996	0.996
Mean dependent var.	75.61	75.61	75.61	75.61	6.107	6.107	6.107	6.107

Notes: The table shows estimations of Equation 1 for employed (Columns 1–4) and unemployment rate (Columns 5–8) using different sets of covariates. Robust SE in parentheses. \dagger Total asylum process captures the number of persons with an ongoing asylum process, who are tolerated, or who are obliged to leave the country, independent of whether they received welfare benefits. Robust SE in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Figure A.4: LIMITED HETEROGENEOUS LABOR MARKET INTEGRATION



Note: The figure estimates the log number of the difference between the total number of persons in the asylum process and the number of welfare recipients for every district in Germany (N=401). The deviation can be regarded as a crude measure of (limited) heterogeneous labor market integration. 95% confidence intervals reported. Overall, the data suggests an employment rate of less than 3% on average for persons with a pending asylum process (including tolerated persons and individuals with pending deportation).

Table A.4: EFFECT OF ASYLUM SEEKERS IN NEIGHBORING COUNTIES

	(1)	(2)	(3)	(4)	(5)	(6)
	Employed (1,000)	Unemploy- ment (%)	Household inc (log)	Employed (1,000) foreigners	Employed (1,000) males	Employed (1,000) females
A.S. neighboring districts $_{t-1}$	0.012 (0.008)	-0.004** (0.002)	0.000** (0.000)	0.008*** (0.002)	0.007 (0.005)	0.006 (0.004)
Pop. neighboring districts $_{t-1}$	-0.001 (0.002)	0.001*** (0.000)	-0.000*** (0.000)	-0.001** (0.001)	-0.001 (0.001)	-0.000 (0.001)
Observations	3,208	3,208	3,206	3,208	3,208	3,208
District X	yes	yes	yes	yes	yes	yes
District FE	401	401	401	401	401	401
Year FE	8	8	8	8	8	8
Mean asylum seekers	5.801	5.801	5.801	5.801	5.801	5.801
Mean dependent var.	75.61	6.108	9.924	6.726	40.74	34.87

Notes: The table replicates the panel estimations from Table 2, using the cumulative number of asylum seekers (A.S.) in neighboring districts (those that share a border to a given district) instead of the local number as main IV, while additionally adjusting for the total resident population in neighboring districts. Robust SE in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Table A.5: EFFECT OF PROTECTION SEEKERS ON LOCAL EMPLOYMENT

	(1)	(2)	(3)	(4)	(5)	(6)
	Employed (1,000)	Unemploy- ment (%)	Household inc (log)	Employed (1,000) foreigners	Employed (1,000) males	females
Protection seeker $_{t-1}$	0.205*** (0.066)	-0.027*** (0.005)	-0.000 (0.000)	0.108*** (0.025)	0.155*** (0.040)	0.061** (0.028)
Observations	3,160	3,160	3,158	3,160	3,160	3,160
District X	yes	yes	yes	yes	yes	yes
District FE	401	401	401	401	401	401
Year FE	8	8	8	8	8	8
Mean asylum seekers	2.537	2.537	2.537	2.537	2.537	2.537
Mean dependent var.	75.61	6.108	9.924	6.726	40.74	34.87

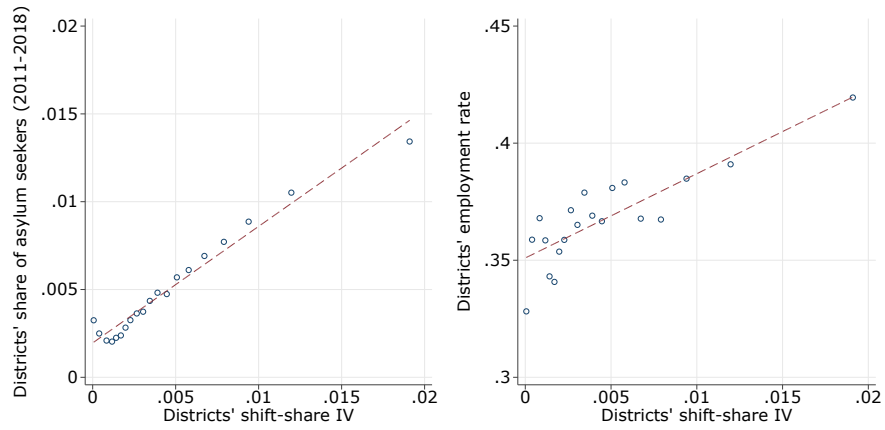
Notes: The table replicates the panel estimations of Table 2 using protection seekers (instead of asylum seekers) as main IV. Robust SE in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Table A.6: SHIFT-SHARE INSTRUMENT

	(1)	(2)	(3)	(4)	(5)	(6)
	Employed (1,000)	Unemploy- ment (%)	Household inc (log)	foreigners	Employed (1,000) males	females
Asylum seekers $_{t-1}$	0.474** (0.234)	-0.219*** (0.053)	0.007*** (0.002)	-0.083 (0.085)	0.080 (0.126)	0.394*** (0.120)
Observations	2,807	2,807	2,805	2,807	2,807	2,807
District X	yes	yes	yes	yes	yes	yes
District FE	401	401	401	401	401	401
Year FE	7	7	7	7	7	7
Mean asylum seekers	0.996	0.996	0.996	0.996	0.996	0.996
Mean shift-share IV	0.005	0.005	0.005	0.005	0.005	0.005
Mean dependent var.	75.61	6.108	9.924	6.726	40.74	34.87
First stage:						
IV instrument	93.235*** (17.593)	93.235*** (17.593)	93.235*** (17.593)	93.235*** (17.593)	93.235*** (17.593)	93.235*** (17.593)
Effective F-statistic	28.022	28.022	28.084	28.022	28.022	28.022
AR p-value	0.041	0.000	0.000	0.383	0.549	0.000

Notes: The table presents 2SLS results of an instrumental variable approach using the 2010 share of asylum seekers among the district's resident population as shift-share style IV. Robust SE in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Figure A.5: SHIFT-SHARE INSTRUMENT



Note: The left-hand panel shows the relationship between the districts' share of asylum seekers in 2011 to 2018 and the past settlement instrument (i.e., the respective asylum seeker stock in 2010). The right-hand panel plots the instrument against one of our main outcomes—the districts' number of workers. Markers reflect aggregations at the local bin.

Table A.7: ARELLANO–BOND ESTIMATOR

	(1)	(2)	(3)	(4)	(5)	(6)
	Employed (1,000)	Unemploy- ment (%)	Household inc (log)	foreigners	Employed (1,000) males	females
Asylum seekers $_{t-1}$	0.293*** (0.084)	-0.006 (0.004)	0.001 (0.001)	0.095*** (0.027)	0.191*** (0.066)	0.103*** (0.023)
Observations	2,807	2,807	2,805	2,807	2,807	2,807
District X	yes	yes	yes	yes	yes	yes
Mean asylum seekers	0.996	0.996	0.996	0.996	0.996	0.996
Mean dependent var.	75.61	6.108	9.924	6.726	40.74	34.87

Notes: The table presents the Arellano–Bond estimator for dynamic panel data in a generalized methods of moments context (lags for periods 2 to 8). Robust SE in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Table A.8: EFFECT WHEN EXCLUDING DISTRICTS WITH REFUGEE CENTERS

	(1)	(2)	(3)	(4)	(5)	(6)
	Employed (1,000)	Unemploy- ment (%)	Household inc (log)	Employed (1,000) foreigners	Employed (1,000) males	Employed (1,000) females
Asylum seekers $_{t-1}$	0.287*** (0.049)	-0.004 (0.010)	0.001* (0.001)	0.063*** (0.015)	0.160*** (0.032)	0.147*** (0.023)
Observations	2,784	2,784	2,783	2,784	2,784	2,784
District X	yes	yes	yes	yes	yes	yes
District FE	348	348	348	348	348	348
Year FE	8	8	8	8	8	8
Mean asylum seekers	0.799	0.799	0.799	0.799	0.799	0.799
Mean dependent var.	60.62	5.957	9.927	5.028	33.09	27.18

Notes: The table replicates the panel estimations of Table 2 excluding all districts that host a refugee reception center. Robust SE in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Table A.9: EFFECT FOR THE PRE-2015 PERIOD ONLY

	(1)	(2)	(3)	(4)	(5)	(6)
	Employed (1,000)	Unemploy- ment (%)	Household inc (log)	Employed (1,000) foreigners	Employed (1,000) males	females
Asylum seekers $_{t-1}$	0.746** (0.307)	-0.059*** (0.020)	-0.001 (0.001)	0.293*** (0.103)	0.569*** (0.184)	0.245* (0.128)
Observations	2,005	2,005	2,005	2,005	2,005	2,005
District X	yes	yes	yes	yes	yes	yes
District FE	401	401	401	401	401	401
Year FE	5	5	5	5	5	5
Mean asylum seekers	0.510	0.510	0.510	0.510	0.510	0.510
Mean dependent var.	72.65	6.590	9.882	5.483	39.26	33.39

Notes: The table performs the main estimation for a restricted sample from 2010 to 2015. The large coefficients indicate that the effect of the local asylum seeker stock follows a decreasing function. Robust SE in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.