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# **THE IMPACT OF SYRIAN REFUGEES ON THE OVEREDUCATION OF NATIVES: EVIDENCE FROM TURKISH LABOR MARKETS**

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## Abstract

The effects of migration on labor market outcomes, such as earnings and employment, have been well-studied in literature. However, there is little attention to how natives adjust their skills to educational requirements of jobs they occupy when they face a massive migration shock. This paper analyzes the effect of Syrian refugee inflows into Turkey beginning in 2011 on the education-job matching of the native population. By using the 2004-2019 household labor force surveys and the regional-level Syrian refugee data, we employ a difference-in-differences methodology that takes account endogenous location choices of refugees as well. We find that a one-point increase in the migrant-to-native ratio significantly reduces the overeducation of the native men in informal employment by 9%. Null effect, on the other hand, is found among native women. However, sub-sample regressions reveal significant negative overeducation effects for native men with low education attainment and aged 18-34. For native women, we also find negative effects in same sub-samples but formal employment. We evidence that our results are mostly driven by employment shifts of natives rather than switching jobs of existing workers.

**Keywords:** refugees, overeducation, immigration, Syria, Turkey, difference-in-differences, instrumental variables

**JEL Classifications:** C26, I25, J24, J61

## ملخص

تمت دراسة آثار الهجرة على نتائج سوق العمل، مثل الدخل والعمالة، دراسة جيدة في الأدبيات. ومع ذلك، هناك القليل من الاهتمام بكيفية تعديل السكان الأصليين لمهاراتهم وفقًا للمتطلبات التعليمية للوظائف التي يشغلونها عندما يواجهون صدمة هجرة هائلة. تحلل هذه الورقة تأثير تدفقات اللاجئين السوريين إلى تركيا بدءًا من عام 2011 على مطابقة الوظائف التعليمية للسكان الأصليين. باستخدام مسوحات القوى العاملة للأسر المعيشية 2004-2019 وبيانات اللاجئين السوريين على المستوى الإقليمي، نستخدم منهجية الاختلاف في الاختلافات التي تأخذ في الاعتبار خيارات الموقع المحلي للاجئين أيضًا. نجد أن زيادة نقطة واحدة في نسبة المهاجرين إلى السكان الأصليين تقلل بشكل كبير من الإفراط في تعليم الرجال الأصليين في العمل غير الرسمي بنسبة 9٪. من ناحية أخرى، يوجد تأثير باطل بين النساء الأصليين. ومع ذلك، فإن التراجع في العينات الفرعية يكشف عن آثار سلبية كبيرة على التعليم المفرط للرجال الأصليين ذوي التحصيل التعليمي المنخفض والذين تتراوح أعمارهم بين 18 و 34 عامًا. بالنسبة للنساء الأصليين، نجد أيضًا آثارًا سلبية في نفس العينات الفرعية ولكن في التوظيف الرسمي. نحن نثبت أن نتائجنا مدفوعة في الغالب بتحويلات التوظيف للسكان الأصليين بدلاً من تغيير وظائف العمال الحاليين.

## 1. Introduction

In most developed countries, high enrollment rates in secondary and tertiary education have caused to concern that labor demand has fully absorbed all skilled labor. Indeed, Verhaest and Van der Velden (2013) found in REFLEX survey covering 11 developed countries that average overeducation incidence, which is the ratio of workers having higher level of schooling than a job required, is about 26%. This ratio amounts to 33% for 25 European countries (Galasi, 2008). Moreover, developing countries also suffer from this problem coupled with the expansion in the higher education institutions. According to Sam (2018), the average incidence in 38 developing countries is around 27% since 1990. Consequently, overeducation results in productivity and wage losses due to the less efficient allocation of resources (Verdugo and Verdugo, 1989; Kiker et al., 1997; Filiztekin, 2011; McGowan and Andrews, 2015).

Turkey is no exception when it comes to overeducation, increasing its incidence rate from 31% to 46% between 2004-2019. During this period, Turkish labor market faced Massive Syrian refugee inflow into Turkish border beginning in 2011. However, no study paid attention to how such refugee influx might have affected occupation positioning of natives based on their educational background even though basically wage and employment effects of this refugee shock on natives have been well documented by numerous studies (Del Carpio and Wagner, 2015; Ceritoglu et al., 2017; Aksu et al., 2022; Cengiz and Tekguc, 2021). Overeducation might have been also affected by this migrant shock because educational distribution of refugees is different from Turkish labor market. As they join labor market with low wage and without registering in social security system, natives may change their job to compete with them (switching effect) or become unemployed due to the crowding out effect (crowding out effect).

Our aim in this study to analyze how natives have adjusted their occupation based on educational backgrounds when they faced a migration shock. We regressed being overeducation against the Syrian refugee/native population ratio capturing other covariates. To identify whether an individual matched or not, we basically utilized ORU (over-, under-educated, and required education) approach developed by Rumberger (1987).

Difference-in-differences estimation with continuous treatment allows us to compare the pre-treatment period of outcomes with treatment considering different migration intensity (see Del Carpio and Wagner (2015); Ceritoglu et al. (2017); Aksu et al. (2022); Cengiz and Tekguc (2021)). We used Turkish Household Labor Force (THLFS) microdata for the period 2004 and 2019. We also considered endogenous location choices of Syrian refugees to regional labor market conditions using instrumental variable approach with distance-based instruments frequently used in migration literature.

In the literature large amount of papers have addressed the link between migration and mismatch. We split them in to three groups. First one is relate to mismatch determinants of migrants and natives themselves separately (Lindley, 2009; Nielsen, 2011; Nieto et al., 2015; Lu and Hou, 2020; Schuss, 2020). In the second group, studies are investigating the emigration behavior of individuals and they found that being overeducated is important determinant when deciding to migrate (Quinn and Rubb, 2005, 2011; Villarreal, 2016). These group of studies also reinforces the necessity of the taking account of the endogeneity between overeducation and migration. Final group, on the other hand, deals with the importance of regional labor market characteristics and mobility opportunities of labor

(Buchel and Van Ham, 2003; Ramos and Sanroma, 2013). These studies found that large labor markets and possibility of spatial labor mobility to find a job helps to reduce overeducation. However, according to our knowledge, our paper is the first attempt to empirically analyze the effect of migrant shock on mismatch of natives. A theoretical study by Zhang (2019) is an exception using Pissarides labor search and matching model. It argues that overeducation in high skill labor market exists because of the worse labor market conditions due to the enlargement in the high skill workers (price effect). On the other hand, labor cost decreases as high skilled immigrants are matched. It leads to increase the expected surplus of skilled filled jobs and decrease the overeducation (composition effect). Overall effect, however, is still an empirical issue. Our study is different because education composition of Syrian refugees is overwhelmingly low-skilled and most of them are informally employed. Moreover, Turkish labor market gradually changes its education composition toward higher levels. Finally, in our specification migration is treated as a shock to labor markets rather than a continuous flow like in US.

Our study may be close to those that investigate the relationship between migration and occupational choice or mobility of natives. For example, Foged and Peri (2016) found that less educated people are forced to pursue non-manual intensive occupations in Denmark when they face migration from eight countries. However, scale of this refugee shock is relatively small compared to our case. There are also studies on whether high-skill immigration affects the occupation choice of natives. Peri and Sparber (2011) and Ma (2020) found that foreign-born graduates and natives are imperfect complements in the US labor market. Crown et al. (2020), on the other hand, pointed out that those skilled migrants would induce natives to specialize in communication and cognitive skill-based occupations. For Turkey, a study by Akgunduz and Torun (2018) is closest to our paper. They found consistent with previous studies that 2.5 million Syrian refugees increase task complexity and induce them to upgrade their ICT-based and abstract tasks, especially among medium-level educated workers.

Hence, our paper fills the gap in the literature in a way that sudden and large-scale migration shock changes the utilization of skills in terms of schooling level. Lack of such utilization, which is a mismatch case in our study, would cause productivity losses in the economic activity and wage losses (Filiztekin, 2011; Verdugo and Verdugo, 1989; Kiker et al., 1997).<sup>3</sup>

Our baseline results show that increase in the migrant-to-native ratio on Turkish subregions significantly decreases the overeducation probability of native men without social security registration. In other words, as the refugee/population ratio increases, natives whose education level is greater than those of a job in informal sector reduces significantly. We could not find significant effect of migration shock on overeducation likelihood of native women.

Further analysis involving sub-sample regressions presents heterogenous effects of migration compared to baseline results. They show that the native men with low-education and aged between 18-34 in formal and informal sector are more likely matched in treated regions. For native women sample, we capture significant negative effect only in sub-sample of low education and young age in formal sector.

To explore mechanisms related with our findings, employment effect of migration rather than

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<sup>3</sup> Reverse relation is also possible. Freeman (1976) states that overeducation in US stems from declining wage gap between skilled and non-skilled workers.

occupation mobility of incumbent workers is main driver of reducing overeducation in main specification. Put differently, newcomers and those exiters in formal or informal labor market due to the migration shock primarily identify the effect of overeducation. However, coupled with the employment effects, low-educated native men in formal and informal sector might move their job suitable for their education level. Women with low education attainment in formal sector are also more likely to have potential to switch their job.

The remainder of the paper proceeds as follows. Section 2 presents data and give information how we measured vertical mismatch. Section 3 discusses estimation method and identification strategy to overcome the endogeneity problem arising from location choices of refugees. We then present our empirical results for overeducation effect of migration and explore possible mechanisms driving the results in Section 4. Finally, Section 5 concludes.

## 2. Data and measurement of vertical mismatch

We used three data sources to investigate the effect of Syrian refugee shock on the (mis)match in the Turkish labor market. We obtained the labor market information of the natives from the THLFS dataset, which has cross-sectional structure for the period 2004-2019. It contains social, demographic, and (un)employment information about the Turkish labor force. We exclude those who born in abroad to keep the native population. Since we are interested in the mismatch situation of natives, our sample are reduced to only employed people. Then our focused sample is working age (18-65) population who are employed full-time in the private sector.<sup>4</sup>

Second and third data source is number of Syrian refugees and distance-based instrument variables at NUTS-2 level from 2013 to 2019 provided by Aksu et al. (2022) and Kırdar et al. (2022). They gathered 2013 and 2014 statistics from The Disaster and Emergency Management and Erdogan (2014), respectively. Other periods are from Directorate General of Migration Management. The instrument variable accounts for the number of Syrians in the other three countries (Lebanon, Jordan, and Iraq) receiving refugees.

There are two approaches in the literature to identify whether an individual is matched or not. Self-reporting approach relies on subjective assessment of individuals for their job. However, this may lead to biased reporting especially an individual has no job satisfaction related with his or her job (Nordin et al., 2010). For this reason and lack of such information in the survey, we used objective approach derived from occupation and schooling information, developed by Rumberger (1987). The key issue in this method is to specify the educational requirements of occupations. To do so, two alternative measures are commonly used: mean definition of Verdugo and Verdugo (1989) and the modal procedure (mode) of Kiker et al. (1997). The mean definition calculates average schooling year of each occupation. Therefore, if a person has years of schooling level greater (less) than the mean job schooling plus (minus) one standard deviation then this approach assigns this worker as over- (under-) educated.<sup>5</sup> However, this approach may be problematic in two aspects. Firstly, since average schooling year has been constantly increasing over time, in some point, all workers in an occupation

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<sup>4</sup> We exclude public sector since its employment generally requires certification or diploma to hire worker, meaning that matching is not sensitive to the migrant shock. However, question that the individual is working in public or private sector is asked to respondents beginning from 2009 survey. To extend sample to previous years, we exclude the industries with highest public sector employment: public administration (84), education (85) and human health and health services (86), which are consist of 86% of total public sector employment. Therefore, we exclude these three industries.

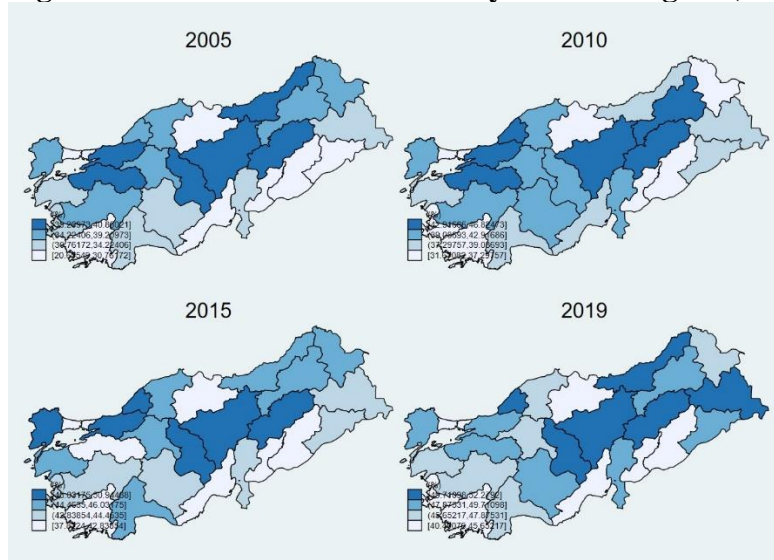
<sup>5</sup> In this study we focus on overeducation case because it becomes more common due to the increases in schooling years of people in Turkey and other developing countries as well.

may be matched. Conversely, over- and under-educated employees has equal share, no body lies in between (required education). Secondly, schooling years between undereducation and overeducation change depending on the occupation averages. Because of these drawbacks, Kiker et al. (1997) developed mode criteria, which defines the educational requirement of an occupation as the most observed schooling year within that occupation. Indeed, this approach would assign some individuals to the required education category by calculation method. The difference between overeducation and undereducation for similar persons is also constant over time. We used both criteria in the estimations but gave more importance to the mode approach because of the advantages mentioned above. However, our procedure is slightly different for both approaches while assigning required schooling years to occupations. Since we have a time dimension in our data and primarily study the effect of a regional variation of a variable over time, entering Syrian refugees into the job market may affect the required education level, especially for basic or routine-based occupations. To avoid such biases, we imposed average values of required schooling years pre-treatment period (2011) for each occupation to other periods.

We specified schooling years based on latest education levels of individuals. 5, 8, 12, 16 years are equivalent to primary, secondary, high, or vocational high school and university degree, respectively. We also assign one year to those who are literate and not having any diploma using literacy course plans for adults in Turkey.

It is evident from Figure 1 that, the share of over-educated individuals increased in most regions. Mediterranean regions seem light-colored, meaning that overeducation shares slightly reduced in those regions. Erzurum subregion in interior Northeast region is also relatively decreased their overeducation share. Gaziantep, Sanliurfa regions in Southeast are almost relatively unaffected with respect to overeducation due to the migration shock. Bursa sub-region on the other hand reduced their relative position in treatment period.

**Figure 1: Over-educated workers by NUTS-2 region (mode approach)**



Source: Authors' own calculations using THLFS data.



### 3. Identification method and estimation

We used difference-in-difference estimation with continuous treatment, which allows us to analyze whether regions with high refugee intensity behave differently compared to ones with less refugee intensity. We also capture other determinants affecting the probability of being overeducated of a worker. We estimate the following equation:

$$y_{ist} = \alpha + X_{ist}\Phi + \beta ratio_{st} + \dot{D}_k + D_{kt} + D_o + D_s + D_{rt} + \varepsilon_{ist} \quad (1)$$

where  $y_{ist}$  is a dummy variable that is equal to 1 if worker  $i$  in subregion  $s$  at time  $t$  has more schooling years than an occupation should adequately require, zero otherwise.  $X_{ist}$  represents worker level control variables. These include eleven age group categories (18-19, 20-21, 22-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, and 60-64), five education categories (literate but no diploma, primary education, secondary education, high school, or vocational high school, and two- or four-year college degree and above), experience in last workplace, attendance to education, occupation, firm size, working in informal employment, gender, and marital status.  $D_o$ ,  $D_s$ ,  $D_t$ ,  $D_k$ , and  $D_{kt}$  are occupation, NUTS-2 region, time, NACE-2 and NACE-2  $\times$  year fixed effects, respectively. We also include NUTS-1 region  $\times$  year fixed effects ( $D_{rt}$ ) to control regional unobservable shocks for each year. As a robustness check, we also used five regions of Turkey<sup>6</sup> and interacted with year. Finally, variable of parameter  $\beta$  shows the effect of the ratio of Syrian refugee to total subregion (NUTS-2) population on the dependent variable.

Estimating the equation above with OLS is problematic especially when there is endogeneity between explanatory variables and the error term  $\varepsilon_{ist}$ . Our variable of interest may suffer from this problem because Syrian refugees choose their location based on employment and economic conditions. Given the fact that employment conditions are correlated with the matching of workers with appropriate jobs, we need to take into account the potential endogenous relationship between Syrian/population ratio and error term.<sup>7</sup> Therefore, we utilized an instrumental variable approach. In the migration literature, distance-based instruments have been frequently used for massive inflow. For example, Del Carpio and Wagner (2015) weighted the total number of Syrians with distance between governorate and Turkish subregions, and the fraction of Syrian population in each governorate at the pre-war period. Akgunduz and Torun (2018), on the other hand, used the origin of Syrian refugees in Turkey and calculate ted fraction of them within total Syrian refugees. Finally, Kırdar et al. (2022) took into account the distances of governorates to other bordering countries (Iraq, Jordan, and Lebanon). We also adopted these instruments because Syrians might choose the closest country to their town. This instrument can be formulated as follows,

$$I_{st} = \sum_{g=1}^{13} \frac{\left(\frac{1}{d_{g,T}}\right) \omega_g}{\left(\frac{1}{d_{g,T}} + \frac{1}{d_{g,I}} + \frac{1}{d_{g,L}} + \frac{1}{d_{g,J}}\right)} \frac{R_t}{d_{g,j}}$$

Where  $d_{g,T}$ ,  $d_{g,I}$ ,  $d_{g,L}$ ,  $d_{g,J}$  are distance between governorate  $g$  and Turkey, Iraq, Lebanon, and Jordan respectively.  $\omega_g$  is pre-war population share of governorate  $g$ .  $R$  is total number of

<sup>6</sup> We defined these regions as follows: 1. West (NUTS-1 classification 1 to 4), 2. central (NUTS-1 classification 5 and 7), 3. South (NUTS-1 classification 6), 4. North (NUTS-1 classification 8 and 9), 5. East (NUTS-1 classification 10 to 12).

<sup>7</sup> In particular, as Wanner et al. (2021) put forward, educational mismatch are associated with emigration behavior of natives and migrants' returning home decisions or migration to the third countries. They found negative relationship between overeducation and emigration, especially among non-Europeans.

refugees in four countries.  $d_{j,g}$  is distance of each subregion  $j$  to Syrian governorate. We also estimate this equation for different sub-samples to see how different native groups responds to migrant shock. Given that the most Syrian refugees are low educated and employed in low skill occupations, correspondent natives may fall into lower occupations below their educational background. On the other hand, increasing demand to goods and services due to the refugees may force employers to hire qualified labor or upgrade the occupation level of existing employment. Sign, magnitude, and significance of this coefficient would identify which effect dominates.

We should keep in mind that findings when estimating the equation (1) and interpretations above cover only those who are in employed status. Two possible mechanisms arise here about the source of coefficient of interest. On the one hand, existing employees may respond to migration shock by changing their occupation and this affects the matching positively or negatively, depending on the mechanisms we mentioned above. On the other hand, migration may generate employment or displacement for natives. This also affects the  $\beta$  if displaced or newcomer matched (or mismatched) employees are overwhelmed. In order to check which effect is dominant, we also estimate the determinants of being required educated and undereducated using equation (1). If these models provide significant evidence on the effect of Syrian migration, it would show that first mechanism dominates. Contrary, insignificant effect of migration imply the dominance of employment effect. In order to see whether displacement or employment generation effect works in second mechanism, we estimate an employment model as follows:

$$z_{ist} = \alpha + X_{ist}\Phi + \theta ratio_{st} + D_s + D_{rt} + \varepsilon_{ist} \quad (2)$$

Where  $z_{ist}$  is dummy variable which takes 1 if labor force status of individual  $i$  is employed. For example, a negative and significant coefficient  $\theta$  in this setting points us that composition effect may work by crowding out some natives from the labor market.

### 3.1 Placebo tests of instruments

Validity of identification we put forward above requires that instrumental variables are not correlated with pre-shock unobserved residual trends in equation (1) except  $ratio_{jt}$  variable. Violation of this assumption fails to hold exclusion restriction (i.e. parallel trends). We implement this test with three steps. Firstly, we obtain residuals using personal characteristics and fixed effects of equation 1. Secondly, we regress these residuals on the trend variable for each region and get 26 coefficients. Finally, we correlate these coefficients with 2019 value of instrument. Not significant relationship confirms that overeducation trends between treatment and control group in pre-shock period are the same.

Table 1 shows the placebo test for main specification. The fact that positive and significant correlation in some specifications of native women of formal employment and native men of informal employment is observed violates the exclusion restriction. However, including the interaction of region and year fixed effects in column 7 and 8 of in men sample turns out insignificant and keeps the validity of the assumption that instrument is not correlated with trends. On the other hand, adding five big regions in column 3 of women sample leads positive and significant. Since our preferred specification is those with NUTS  $\times$  year fixed effects and overeducation effect of migrants on native women is mostly insignificant as we explain below, this finding does not become suspicious our interpretations in overeducation model.

## 4. Results

### 4.1 Effects on overeducation by gender

Table 2 provides the estimates of the effect of immigrants on overeducation probability of native men in formal and informal sectors. This table only reports the coefficient of interest  $\beta$  in equation (1). Columns 1 to 4 show OLS estimates, while 4 to 8 show 2SLS estimates for different set of fixed effects. First and fifth column has no any covariate. In these columns migration shock increases being overeducated of natives. However, once we add controls demographic (education, marital status, age group, gender) and employment related (region, occupation, industry, year, industry  $\times$  year, firm size, working in informal employment) fixed effects in second and sixth columns, estimates substantially change and turn to be statistically insignificant. This evidence imply that demographic characteristics and labor market conditions of workforce is crucial determinant when analyzing the overeducation effect of migration.

Interesting results emerge from last columns of each estimation method, which additionally capture the region and its interaction with time fixed effects. When we include five region  $\times$  year fixed effects, OLS and 2SLS estimators do not provide significant results. Replacing these with NUTS-1  $\times$  year fixed effects provide significant result only in OLS estimation. Since 2SLS results tackle selection issue, this specification should base for interpretation. Coefficients are negative and statistically insignificant in formal employment, meaning that effect of migration on the likelihood of being overeducated is null. In informal sector side, while interacting year dummies with five regions does not provide significant overeducation effect, defining region as NUTS-1 provides very significant and negative coefficients. In other words, likelihood of being overeducated decreases by at least 9% of a worker when controlling all covariates. This evidence is relevant because one-fourth of men workforce is employed in informal sector. Among two we prefer this specification because NUTS-1 is relatively more plausible than the five-region definition due to being the official definition considering populations and economic levels of regions and capturing more local shocks. In addition, due to the fact that our identification assumption in whole sample estimation mainly holds for these specifications, we present the estimates of them for different sub-samples below.<sup>8</sup> Hence, our interpretations are mostly fed by these estimates as well. Figure 2 and 3 plot the changes in the coefficient estimates for each year. We see in former figure that estimates except 2016 are not statistically different than zero. It is consistent with average affect in column 8 of Table 2 as we explain above. On the other hand, estimates are around zero until 2011 and most of them become significantly negative in latter figure. This figure also confirms the average effect apparently and imply that higher migrant-to-native ratio causes to lower overeducation in informal sector.

In Table 3 we report estimated effects of migrant-to-native ratio on overeducation status for women. While closer inspection of the Table shows that there is significant and positive effect of migration if no control variables and fixed effects are captured at first panel, it disappears as the covariates are added. Although weak evidence is seen in full specification of OLS estimator, it also vanishes in 2SLS. On the other hand, we do not find any significant estimate in informal sector. Further analysis using event study in figure 4 and 5 also indicates that no evidence is found for associations between migration shock and overeducation. This evidence implies that Syrian refugee shock does not considerably change the job education

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<sup>8</sup> We gladly share the full specifications upon request.

matching composition of women. On the other hand, this situation may differ in sub-samples. Therefore, the next section of the analysis is concerned with how different groups of natives respond to migration shock.

#### *4.1.1 Overeducation by age group of natives*

The population in Turkey is quite young compared to developed countries. Figuring out how to use this resource efficiently requires availability of jobs that match with education level employees have. In this sense, unexpected labor supply increase in treated regions may constitute a different consequence for existing workforce and change the career trajectory of those especially at early stages in labor market because of their un-experienced status. This section investigates how and extent to which migrant shock transmit into the likelihood of overeducation. The results obtained from the regression analysis estimating equation (1) for three age group (18-34, 35-54, and 55-64) of men are shown in Table 4. Our preferred specifications (column 4 and 8) in young age group including NUTS-1  $\times$  year fixed effects show the strong evidence of negative overeducation effect of migration shock. In contrast to the Table 2, a significant negative effect is also observed in formal sector. Compared to corresponding result in informal sector, on the other hand, migration is shown to have less effect. Finally, overeducation appears to be unaffected by native-to-population ratio in other age groups for both formal and informal sectors.

If we now turn to the analysis carried out for native women, it can be seen in Table 5 that migration shock significantly reduces probability of overeducation of young age groups by 15.4% despite of null effect in whole sample estimation. This finding also imply the importance of this demographic characteristic to evaluate the migration effects. No significant evidence is found in informal sector and other age groups. Exception to this argument is older sample in formal sector, having weak and positive overeducation effect of migration. We elaborately discuss below these results by combining with the employment model results.

#### *4.1.2 Overeducation by education level of natives*

Syrian refugees in Turkey are mostly low-educated and their participation to labor market may cause to change occupations that are not associated with their low education of some natives. This effect may vary between education level of natives because labor demand to high educated workers increases due to the enhancing economic dynamism in general. This section is related with the adjustments of natives with different education groups in terms of job-education compatibility when they face a massive migrant shock.

Table 6 illustrates the overeducation model results of native men by splitting education level into two groups. While low educated natives who completed primary and secondary education, high educated group consist of tertiary education (vocational high school and four year college degree). Former group results at top half panel show very significant and negative coefficient in informal sector. In other words, regions with high migrant-to-population ratio are more likely to have lower overeducation probability in this sector. We also see reducing overeducation effect of migration in formal sector. However, this evidence is statistically significant at 10% level. In high education sample, we found null effect of migration shock.

Turning now to the statistical evidence on the mismatch effect of migration for native women in Table 7, it can be seen that no stronger coefficient is obtained. We only have weak evidence of negative effect in formal sector of low education. These findings implies that even though migration leads to adverse effects of labor market outcomes of women (Del Carpio and Wagner, 2015; Ceritoglu et al., 2017; Aksu et al., 2022), this does not constitute overeducation mismatch.

#### *4.2 Understanding the mechanisms of our results: Effects on Undereducation, Required Education, and Employment by gender and sub-samples*

We have found in previous section that men in informal sector were negatively affected by refugee shock. In sub-sample estimates, this reducing mismatch effect have been observed for young aged and low educated men in both (formal and informal) sectors. Moreover, women sample regressions showed that that only young-aged population have less overeducated in regions with high migrant to population ratio. However, these results do not give possible channels how this reducing effect realize through existing workers in labor market by changing their occupation or through those who leave or enter the labor market. To identify which effect is dominant, firstly we estimate required education and undereducation models to see whether existing workers change their occupation. For example, if migrant to population ratio reduces the overeducation of workers, they would be matched or undereducated. On the other hand, newcomers or displacement worker effect may operate when migration insignificantly affect the required education and undereducation. That is why we estimate an employment model in second step. Negative (positive) and significant coefficient in this model would showed that migration shock displaces natives and contribute to the overeducation effect in this way.

As it is formed in Table 2, each cell in Table 8 shows the effect of migration/native ratio on required education and undereducation of men for formal and informal sectors using IV estimator. We see in all sample estimates of first line that there is no significant effect of refugee shock on both matching definitions. What emerges from these estimates is that negative and significant overeducation coefficient in informal sector of Table 2 primarily comes from the employment effect of refugees. Further analysis of employment model results for men in Table 10 reveals that migration shock reduces the probability of being employed in informal sector by 18.6% when controlling NUTS-2  $\times$  times fixed effect in column 8. An implication of these findings of three tables is the possibility that men in informal sector become less overeducated due to the overeducated workers were crowded out from this labor market. In column 4 we see positive employment effect of migration in formal sector as consistent with Aksu et al. (2022). Since insignificant matching and mismatch effect in Tables 2 and 8 has been found, we conclude that newcomers to the formal sector because of the migration shock do not change the matching probability.

In some sub-samples, however, few significant effects in men sample are captured. 55-64 age group of Table 8 in fourth line has negative and significant undereducation effect in informal sector of column 8. In addition, coefficient on migration in required education model is positive and significant even though it is insignificant in overeducation model. These findings argue that workers who have education level less than a job required move to their matched jobs in treated regions. Apart from this sub-sample, low education of formal and informal sector in fifth sub-sample group reports that migrant to native ratio positively affects the matching probability in our preferred specifications (column 2 and 6). In column 4 the sign of coefficient is significantly reversed. Combining these findings with negative overeducation

effect in Table 4 implies the mobility of natives toward suitable jobs in terms of their education in treated regions. Employment regressions also show positive effect in corresponding coefficient of Table 10. This might further indicate that low educated newcomers and incumbents in formal labor market jointly identify the negative overeducation coefficient of migration. Since no significant effect is obtained in other cells in required education and undereducation regressions, we conclude that overeducation effect is primarily sourced from that exit or enter to labor market in question.

In women sample as seen in Table 9 there is significant and positive association between undereducation and migration ratio in formal sector of all sample estimations. Since this effect does not significantly translate into negative required education probability, we conclude that this enhancing mismatching effect mostly stems from the employment effect of migration. All sample estimates in Table 11 also report a negative and significant effect of migration on women employment in formal sector, pointing that displaced workers may identify this positive coefficient in undereducation model. Since most sub-sample estimates of both estimates are jointly insignificant, they support the idea that significant mismatch coefficients are sourced from the employment effect. Exceptions to this finding are young age women sub-sample in informal sector and low education sub-sample in formal sector. In former case increasing undereducation probability when natives face migration shock also lower matching probability significantly. This finding with positive employment effect in related cell of Table 11 shows the employment effect and incumbent young women become more undereducated in informal sector. In the latter case, despite of weak evidence in overeducation model estimates seen in Table 4 for low-educated women sample in formal sector, required education is also affected positively by migration shock. These results may help us to understand that some women change their occupation to those which are compatible with their education.

## **5. Conclusion**

Growing body of literature has analyzed the labor market effects of Syrian refugees. They argued that wage and employment of natives are little affected by the migrant shock contrary to the canonical migration model. In addition, complementary effects have been revealed among high educated natives, causing to increase their employment and wages. At the same time, some studies found occupational upgrading, arguing that skill mix of natives move toward more complex tasks when they face migrant shock. This study combines both the education and occupation natives hold and analyzed how mismatching (overeducation) between two is affected by the migrant shock.

The results of this investigation show that Syrian refugee flow contributed to reduce overeducation of native men in informal employment even if we control endogenous location choices of migrants. In addition, heterogeneous effects of migration on overeducation are found when different sub-samples of Turkish natives are tested separately. Separating by age group, likelihood of being overeducated of younger native men are negatively affected by migration shock in formal and informal employment. Similar findings are also obtained in native men with low education attainment. Finally, we find significant negative overeducation effect of migration in younger and low educated women in formal sector. As possible mechanism behind our results, we show evidence pointing to employment shifts in formal and informal sectors. However, incumbents of low-educated men in formal and informal sector drive the reducing overeducation effect by switching their jobs. Among low-educated women this mechanism is valid only for formal sector. Taken together, these

findings suggest a role for informality and displacement or labor demand effect of employment in understanding sources of changes in overeducation against a sudden labor supply shock. Policymakers should take account these dimensions to direct migration and labor policies.

## References

- Akgunduz, Yusuf Emre and Huzeyfe Torun, “Two and a half million Syrian refugees, skill mix and capital intensity,” Technical Report, GLO Discussion Paper 2018.
- Aksu, Ege, Refik Erzan, and Murat Guray Kırdar, “The impact of mass migration of Syrians on the Turkish labor market,” *Labour Economics*, 2022, 76, 102183.
- Buchel, Felix and Maarten Van Ham, “Overeducation, regional labor markets, and spatial flexibility,” *Journal of Urban Economics*, 2003, 53 (3), 482–493.
- Carpio, Ximena V Del and Mathis C Wagner, “The impact of Syrian refugees on the Turkish labor market,” *World Bank policy research working paper*, 2015, (7402).
- Cengiz, Doruk and Hasan Tekguc, “Is it merely a labor supply shock? impacts of Syrian migrants on local economies in Turkey,” *ILR Review*, 2021, p. 0019793920978365.
- Ceritoglu, Evren, H Burcu Gurcihan Yunculer, Huzeyfe Torun, and Semih Tumen, “The impact of Syrian refugees on natives’ labor market outcomes in Turkey: evidence from a quasi-experimental design,” *IZA Journal of Labor Policy*, 2017, 6 (1), 1–28.
- Crown, Daniel, Alessandra Faggian, and Jonathan Corcoran, “High skilled immigration and the occupational choices of native workers: the case of Australia,” *Oxford Economic Papers*, 2020, 72 (3), 585–605.
- Erdogan, M Murat, “Perceptions of Syrians in Turkey,” *Insight Turkey*, 2014, 16 (4), 65.
- Filiztekin, Alpay, “Education-occupation mismatch in Turkish labor market,” 2011.
- Foged, Mette and Giovanni Peri, “Immigrants’ effect on native workers: New analysis on longitudinal data,” *American Economic Journal: Applied Economics*, 2016, 8 (2), 1–34.
- Freeman, Richard, *The overeducated American*, Academic press, New York, 1976.
- Galasi, Peter, “The effect of educational mismatch on wages for 25 countries,” Technical Report, Budapest Working Papers on the Labour Market 2008.
- Kiker, Billy Frazier, Maria C Santos, and M Mendes De Oliveira, “Overeducation and undereducation: Evidence for Portugal,” *Economics of Education Review*, 1997, 16 (2), 111–125.
- Kırdar, Murat G, Ivan Lopez Cruz, and Betul Turkum, “The effect of 3.6 million refugees on crime,” *Journal of Economic Behavior & Organization*, 2022, 194, 568–582.
- Lindley, Joanne, “The over-education of UK immigrants and minority ethnic groups: Evidence from the Labour Force Survey,” *Economics of Education Review*, 2009, 28 (1), 80–89.
- Lu, Yao and Feng Hou, “Immigration System, Labor Market Structures, and Overeducation of High-Skilled Immigrants in the United States and Canada,” *International migration review*, 2020, 54 (4), 1072–1103.
- Ma, Jie, “High skilled immigration and the market for skilled labor: The role of occupational choice,” *Labour Economics*, 2020, 63, 101791.
- McGowan, Muge Adalet and Dan Andrews, “Labour Market Mismatch and Labour Productivity,” 2015, (1209).
- Nielsen, Chantal Pohl, “Immigrant over-education: evidence from Denmark,” *Journal of Population Economics*, 2011, 24 (2), 499–520.
- Nieto, Sandra, Alessia Matano, and Raul Ramos, “Educational mismatches in the EU: Immigrants vs natives,” *International Journal of Manpower*, 2015.
- Nordin, Martin, Inga Persson, and Dan-Olof Rooth, “Education–occupation mismatch: Is there an income penalty?,” *Economics of education review*, 2010, 29 (6), 1047–1059.
- Peri, Giovanni and Chad Sparber, “Highly educated immigrants and native occupational choice,” *Industrial Relations: a journal of economy and society*, 2011, 50 (3), 385–411.



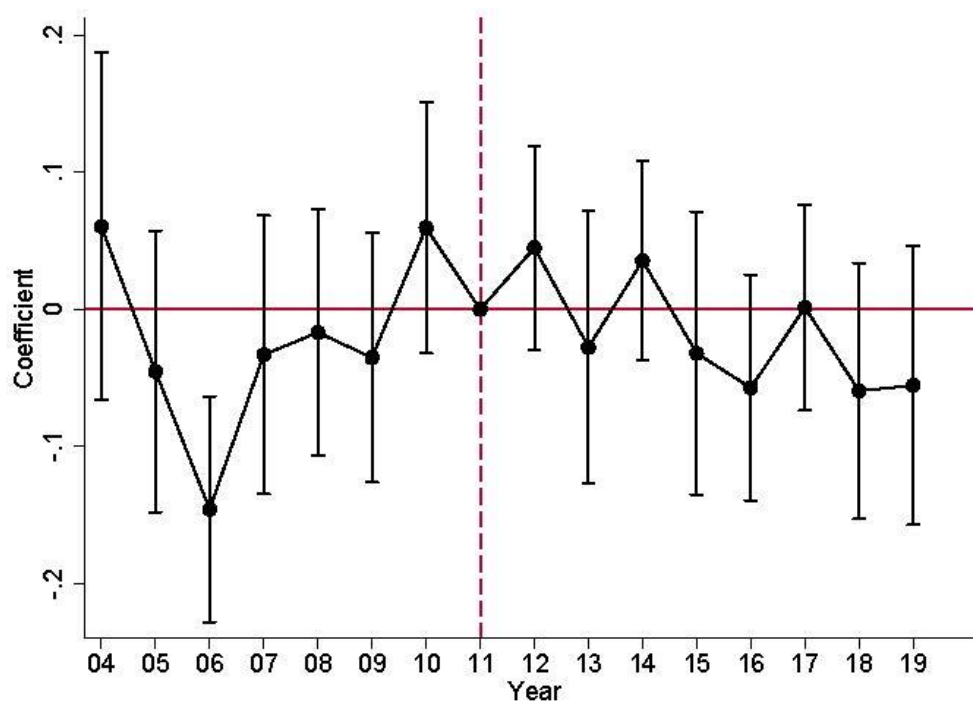
- Quinn, Michael A and Stephen Rubb, “The importance of education-occupation matching in migration decisions,” *Demography*, 2005, 42 (1), 153–167.
- , “Spouse overeducation and family migration: Evidence from the US,” *Journal of family and economic issues*, 2011, 32 (1), 36–45.
- Ramos, Raul and Esteban Sanroma, “Overeducation and Local Labour Markets in Spain,” *Tijdschrift voor economische en sociale geografie*, 2013, 104 (3), 278–291.
- Rumberger, Russell W, “The impact of surplus schooling on productivity and earnings,” *Journal of Human resources*, 1987, pp. 24–50.
- Sam, Vichet, “Overeducation among graduates in developing countries: What impact on economic growth?,” 2018.
- Schuss, Eric, “Do Ethnic Networks Ameliorate Education–Occupation Mismatch?,” *LABOUR*, 2020, 34 (4), 441–476.
- Verdugo, Richard R and Naomi Turner Verdugo, “The impact of surplus schooling on earnings: Some additional findings,” *Journal of human resources*, 1989, pp. 629–643.
- Verhaest, Dieter and Rolf Van der Velden, “Cross-country differences in graduate overeducation,” *European Sociological Review*, 2013, 29 (3), 642–653.
- Villarreal, Andre’s, “The education-occupation mismatch of international and internal migrants in Mexico, 2005–2012,” *Demography*, 2016, 53 (3), 865–883.
- Wanner, Philippe, Marco Pecoraro, and Massimiliano Tani, “Does Educational Mismatch Affect Emigration Behaviour?,” *European Journal of Population*, 2021, 37 (4), 959–995.
- Zhang, Shiyun, *Essays on Immigration and Frictional Labor Markets*, University of California, Riverside, 2019.

**Table 1: Placebo test of instrumental variables impact on residual trends of overeducation, main specification**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	FORMAL SECTOR				INFORMAL SECTOR			
MEN								
<i>Instrument in 2019</i>	0.025 (0.051)	0.007 (0.014)	0.006 (0.012)	0.009 (0.009)	0.099 (0.058)	0.026** (0.009)	0.009 (0.009)	0.007 (0.009)
WOMEN								
<i>Instrument in 2019</i>	0.170 (0.179)	0.128** (0.046)	0.095** (0.038)	0.043 (0.062)	0.032 (0.066)	0.036 (0.021)	0.011 (0.021)	-0.008 (0.014)
Controls	-	+	+	+	-	+	+	+
Five region x year FE	-	-	+	-	-	-	+	-
NUTS-1 x year FE	-	-	-	+	-	-	-	+

Notes: 2004-11 period. Each coefficient shows the impact of instrument 2019 value on the residual trend slope of overeducation. The equations we predict the residuals include controls, region fixed effects and its time interactions, and as shown above. Controls are occupation, experience categories, region, industry, year, education categories, marital status age group, industry  $\times$  year, firm size, gender, and working in informal employment fixed effects. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Standard errors are clustered at NUTS-2  $\times$  year.

**Figure 2: Syrian refugees and overeducation of native men in formal sector: Coefficient estimates for each year**



Notes: This figure plots the coefficient of the regressions examining the yearly effects from 2004 to 2019 for native men in formal employment. Identification is equivalent to equation (1) with NUTS-1  $\times$  year fixed effects. Variable of interest (Syrian refugee/population) is instrumented with distance-based shift share variables discussed in Section 3.

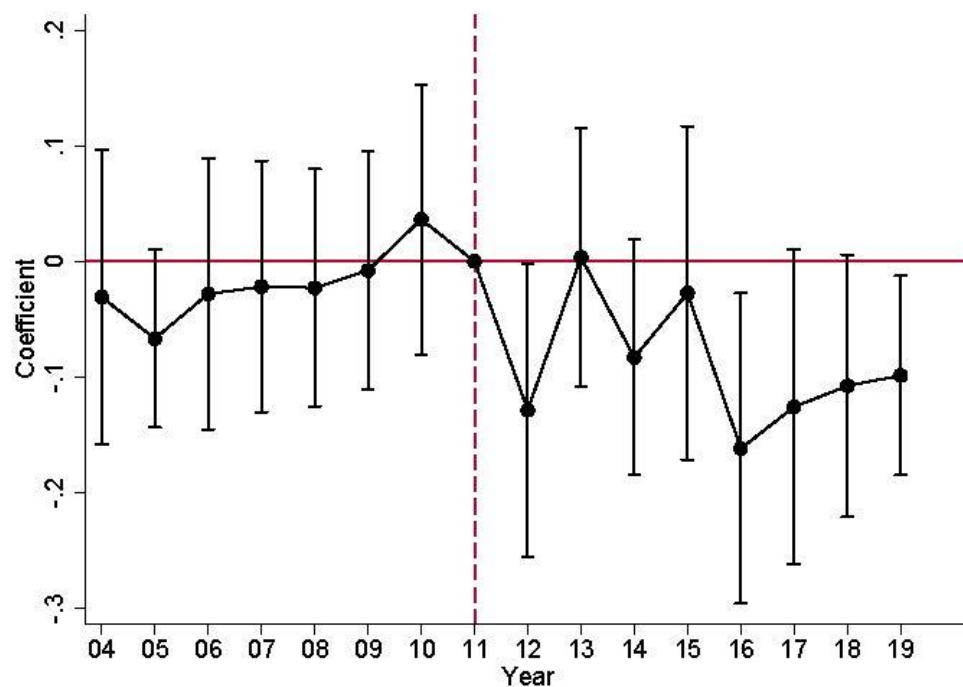
**Table 2: Effect of Migrant-to-Native Ratio on Overeducation of Native Men in the Formal and Informal Sectors**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	OLS	OLS	OLS	2SLS	2SLS	2SLS	2SLS
FORMAL SECTOR								
Refugees/pop.	0.454***	-0.026*	-0.022	-0.050**	1.028***	-0.012	-0.017	-0.034
	(0.080)	(0.014)	(0.016)	(0.022)	(0.192)	(0.016)	(0.018)	(0.023)
First stage F-stat.					394.9	1093	970.7	837.3
Observations	612,388	606,938	606,938	606,938	612,398	606,938	606,938	606,938
INFORMAL SECTOR								
Refugees/pop.	0.820***	0.014	0.001	-0.062**	1.325***	0.010	-0.028	-0.091***
	(0.078)	(0.019)	(0.021)	(0.027)	(0.171)	(0.021)	(0.021)	(0.030)
First stage F-stat.					545.8	1249	936.7	592.3
Observations	218,100	195,268	195,268	195,268	218,100	195,268	195,268	195,268
Controls	-	+	+	+	-	+	+	+
Five region x year FE	-	-	+	-	-	-	+	-
NUTS-1 x year FE	-	-	-	+	-	-	-	+

Notes: Each coefficient shows the effect of Syrian refugee/native ratio on overeducation for 2004-19 period. Controls are experience categories, region, occupation, industry, year, education, marital status age group, industry  $\times$  year, firm size, gender, and working in informal employment fixed effects. NUTS-1 or five region  $\times$  year fixed effects are added as shown above.

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Standard errors are clustered at NUTS-2  $\times$  year.

**Figure 3: Syrian refugees and overeducation of native men in informal sector: Coefficient estimates for each year**



Notes: This figure plots the coefficient of the regressions examining the yearly effects from 2004 to 2019 for native men in formal employment. Identification is equivalent to equation (1) with NUTS-1  $\times$  year fixed effects. Variable of interest (Syrian refugee/population) is instrumented with distance-based shift share variables discussed in Section 3.

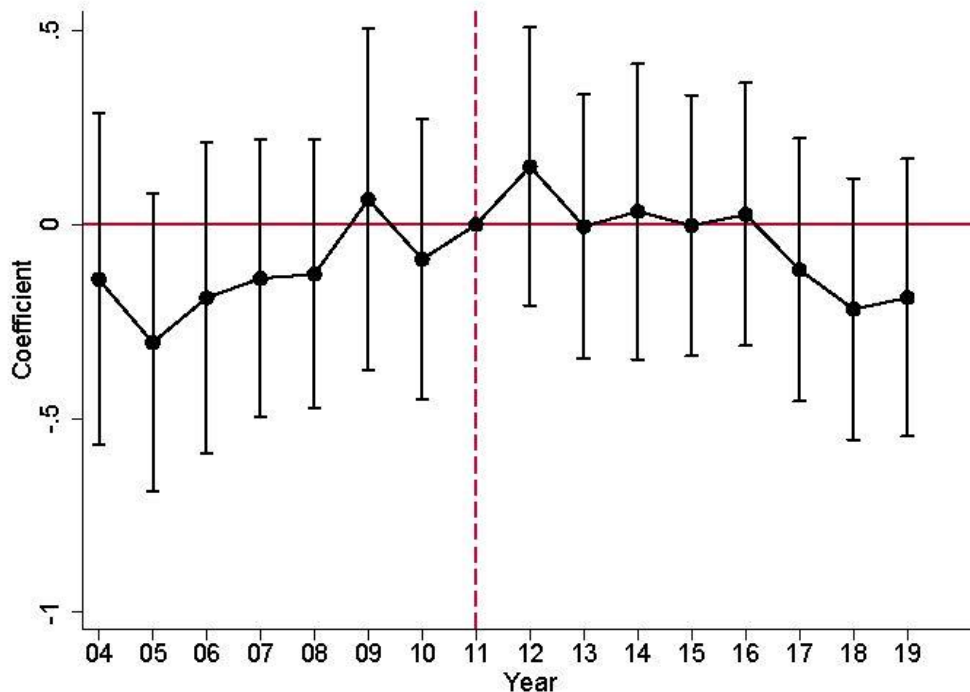
**Table 3: Effect of Migrant-to-Native Ratio on Overeducation of Native Women in the Formal and Informal Sectors**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	OLS	OLS	OLS	2SLS	2SLS	2SLS	2SLS
FORMAL SECTOR								
Refugees/pop.	0.457***	0.005	-0.053	-0.091*	1.114***	0.092*	-0.061	-0.083
	(0.086)	(0.041)	(0.040)	(0.051)	(0.191)	(0.055)	(0.049)	(0.063)
First stage F-stat.					323.8	669.2	701.4	562.3
Observations	161,572	159,744	159,744	159,744	161,572	159,744	159,744	159,744
INFORMAL SECTOR								
Refugees/pop.	-0.010	-0.016	-0.034	0.055	-0.109	-0.012	-0.038	0.034
	(0.067)	(0.029)	(0.032)	(0.040)	(0.078)	(0.032)	(0.037)	(0.046)
First stage F-stat.					632.5	1422	592	455.1
Observations	72,381	65,857	65,857	65,857	72,381	65,857	65,857	65,857
Controls	-	+	+	+	-	+	+	+
Five region x year FE	-	-	+	-	-	-	+	-
NUTS-1 x year FE	-	-	-	+	-	-	-	+

Notes: Each coefficient shows the effect of Syrian refugee/native ratio on overeducation for 2004-19 period. Controls are experience categories, region, occupation, industry, year, education, marital status age group, industry × year, firm size, gender, and working in informal employment fixed effects. NUTS-1 or five region × year fixed effects are added as shown above.

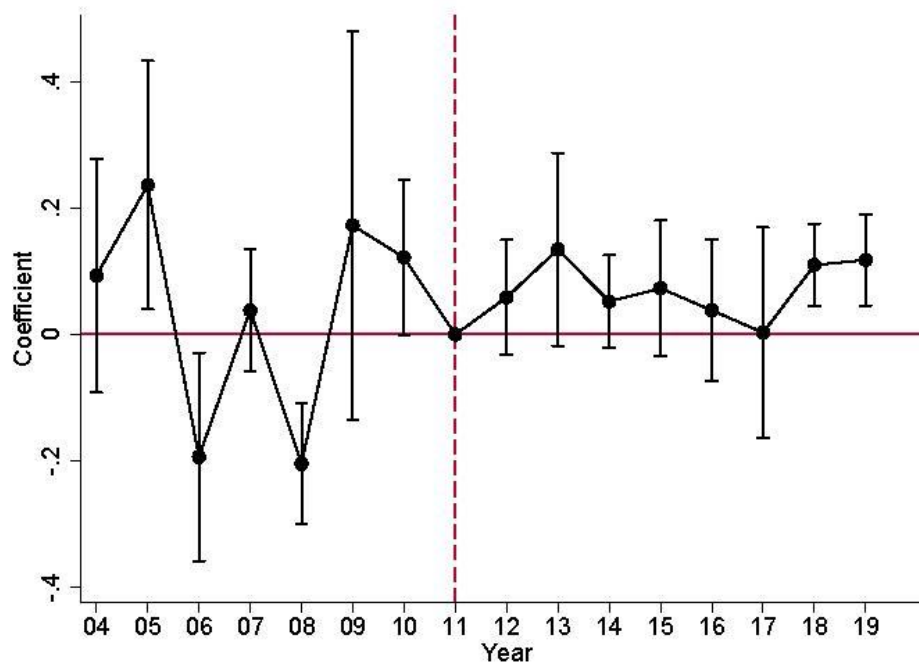
\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Standard errors are clustered at NUTS-2 × year.

**Figure 4: Syrian refugees and overeducation of native women in formal sector: Coefficient estimates for each year**



Notes: This figure plots the coefficient of the regressions examining the yearly effects from 2004 to 2019 for native women in formal employment. Identification is equivalent to equation (1) with NUTS-1 × year fixed effects. Variable of interest (Syrian refugee/population) is instrumented with distance-based shift share variables discussed in Section 3.

**Figure 5: Syrian refugees and overeducation of native women in informal sector:  
Coefficient estimates for each year**



Notes: This figure plots the coefficient of the regressions examining the yearly effects from 2004 to 2019 for native women in informal employment. Identification is equivalent to equation (1) with NUTS-1  $\times$  year fixed effects. Variable of interest (Syrian refugee/population) is instrumented with distance-based shift share variables discussed in Section 3.

**Table 4: Effect of Migrant-to-Native Ratio on Overeducation of Native Men in the Formal and Informal Sectors by Age Group**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	OLS	2SLS	2SLS	OLS	OLS	2SLS	2SLS
	FORMAL SECTOR				INFORMAL SECTOR			
18-34	-0.013	-0.095***	-0.029	-0.068**	-0.023	-0.096***	-0.037	-0.099***
Refugees/pop.	(0.023)	(0.028)	(0.025)	(0.031)	(0.026)	(0.033)	(0.027)	(0.034)
First stage F-stat.			1019	862.9			1079	578.5
Observations	307,870	307,870	307,870	307,870	102,667	102,667	102,667	102,667
35-54								
Refugees/pop.	0.004	0.027	0.039	0.046	0.026	-0.013	-0.002	-0.053
	(0.025)	(0.032)	(0.026)	(0.034)	(0.029)	(0.045)	(0.031)	(0.049)
First stage F-stat.			933	812.1			867.4	605.5
Observations	284,047	284,047	284,047	284,047	76,932	76,932	76,932	76,932
55-64								
Refugees/pop.	-0.220**	-0.223*	-0.204**	-0.223	-0.068	-0.119	-0.075	-0.129
	(0.093)	(0.132)	(0.102)	(0.142)	(0.074)	(0.088)	(0.080)	(0.098)
First stage F-stat.			930.1	787.3			647.4	528
Observations	14,857	14,857	14,857	14,857	15,309	15,309	15,309	15,309
Controls	+	+	+	+	+	+	+	+
Five region x year FE	+	-	+	-	+	-	+	-
NUTS-1 x year FE	-	+	-	+	-	+	-	+

Notes: Each coefficient shows the effect of Syrian refugee/native ratio on overeducation for 2004-19 period. Controls are experience categories, region, occupation, industry, year, education, marital status age group, industry × year, firm size, gender, and working in informal employment fixed effects. NUTS-1 or five region × year fixed effects are added as shown above.

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Standard errors are clustered at NUTS-2 × year.

**Table 5: Effect of migrant-to-native ratio on overeducation of native women in the formal and informal sectors by age group**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	OLS	2SLS	2SLS	OLS	OLS	2SLS	2SLS
	FORMAL SECTOR				INFORMAL SECTOR			
<b>18-34</b>								
Refugees/pop.	-0.080*	-0.154***	-0.102**	-0.154**	-0.082	0.065	-0.080	0.038
	(0.046)	(0.056)	(0.051)	(0.062)	(0.067)	(0.090)	(0.078)	(0.101)
First-stage F-stat.			714.4	567.2			618.1	450.3
Observations	95,858	95,858	95,858	95,858	30,047	30,047	30,047	30,047
<b>35-54</b>								
Refugees/pop.	-0.044	0.027	0.016	0.087	-0.035	-0.050	-0.053	-0.059
	(0.068)	(0.090)	(0.088)	(0.116)	(0.033)	(0.046)	(0.039)	(0.051)
First-stage F-stat.			605.2	465			539	418
Observations	61,909	61,909	61,909	61,909	30,757	30,757	30,757	30,757
<b>55-64</b>								
Refugees/pop.	-0.690	-0.785	0.464	0.213	0.042	0.016	0.079**	0.083*
	(0.636)	(0.762)	(0.818)	(0.973)	(0.038)	(0.046)	(0.036)	(0.046)
First-stage F-stat.			230.8	195.9			340.1	245.9
Observations	1,685	1,685	1,685	1,685	4,725	4,725	4,725	4,725
Controls	+	+	+	+	+	+	+	+
Five region x year FE	+	-	+	-	+	-	+	-
NUTS-1 x year FE	-	+	-	+	-	+	-	+

Notes: Each coefficient shows the effect of Syrian refugee/native ratio on overeducation for 2004-19 period. Controls are experience categories, region, occupation, industry, year, education, marital status age group, industry × year, firm size, gender, and working in informal employment fixed effects. NUTS-1 or five region × year fixed effects are added as shown above.

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Standard errors are clustered at NUTS-2 × year.

**Table 6: Effect of migrant-to-native ratio on overeducation of native men in the formal and informal sectors by education level**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	OLS	2SLS	2SLS	OLS	OLS	2SLS	2SLS
	FORMAL SECTOR				INFORMAL SECTOR			
<b>LOW EDUCATION</b>								
Refugees/pop.	-0.038**	-0.056**	-0.029	-0.044*	-0.011	-0.068***	-0.037**	-0.095***
	(0.018)	(0.026)	(0.019)	(0.026)	(0.018)	(0.025)	(0.018)	(0.026)
First-stage F-stat.			1023	859.8			978.7	602.8
Observations	329,258	329,258	329,258	329,258	155,978	155,978	155,978	155,978
<b>HIGH EDUCATION</b>								
Refugees/pop.	-0.002	-0.056**	-0.007	-0.044	0.009	-0.089	-0.022	-0.097
	(0.025)	(0.028)	(0.027)	(0.030)	(0.048)	(0.079)	(0.056)	(0.087)
First-stage F-stat.			902	791.3			805.4	551.5
Observations	277,650	277,650	277,650	277,650	39,129	39,129	39,129	39,129
Controls	+	+	+	+	+	+	+	+
Five region x year FE	+	-	+	-	+	-	+	-
NUTS-1 x year FE	-	+	-	+	-	+	-	+

Notes: Each coefficient shows the effect of Syrian refugee/native ratio on overeducation for 2004-19 period. Controls are experience categories, region, occupation, industry, year, education, marital status age group, industry  $\times$  year, firm size, gender, and working in informal employment fixed effects. NUTS-1 or five region  $\times$  year fixed effects are added as shown above.

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Standard errors are clustered at NUTS-2  $\times$  year.

**Table 7: Effect of migrant-to-native ratio on overeducation of native women in the formal and informal sectors by education level**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	OLS	2SLS	2SLS	OLS	OLS	2SLS	2SLS
	FORMAL SECTOR				INFORMAL SECTOR			
<b>LOW EDUCATION</b>								
Refugees/pop.	-0.104	-0.176*	-0.144	-0.207*	-0.053	0.022	-0.047	0.009
	(0.077)	(0.101)	(0.095)	(0.117)	(0.033)	(0.041)	(0.039)	(0.048)
First-stage F-stat.			784.5	733.1			601.8	476.9
Observations	62,739	62,739	62,739	62,739	52,884	52,884	52,884	52,884
<b>HIGH EDUCATION</b>								
Refugees/pop.	-0.032	-0.070	-0.049	-0.076	0.063	0.216**	0.053	0.178
	(0.048)	(0.059)	(0.053)	(0.065)	(0.090)	(0.102)	(0.096)	(0.114)
First-stage F-stat.			646.1	470.6			463.5	357.5
Observations	96,855	96,855	96,855	96,855	12,773	12,773	12,773	12,773
Controls	+	+	+	+	+	+	+	+
Five region x year FE	+	-	+	-	+	-	+	-
NUTS-1 x year FE	-	+	-	+	-	+	-	+

Notes: Each coefficient shows the effect of Syrian refugee/native ratio on overeducation for 2004-19 period. Controls are experience categories, region, occupation, industry, year, education, marital status age group, industry  $\times$  year, firm size, gender, and working in informal employment fixed effects. NUTS-1 or five region  $\times$  year fixed effects are added as shown above.

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Standard errors are clustered at NUTS-2  $\times$  year.



**Table 8: Effect of migrant-to-native ratio on required education and undereducation of native men in the formal and informal sectors**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS
	FORMAL SECTOR				INFORMAL SECTOR			
	Req. education		Undereducation		Req. education		Undereducation	
<b>ALL SAMPLE</b>								
Refugees/pop.	0.024	0.040	-0.006	-0.006	0.025	0.082*	0.003	0.009
	(0.033)	(0.041)	(0.020)	(0.023)	(0.033)	(0.049)	(0.020)	(0.028)
First-stage F-stat.	970.7	837.3	970.7	837.3	936.7	592.3	936.7	592.3
Observations	606,938	606,938	606,938	606,938	195,268	195,268	195,268	195,268
<b>18-34</b>								
Refugees/pop.	0.050	0.065	-0.021	0.003	0.014	0.068	0.022	0.031
	(0.044)	(0.053)	(0.028)	(0.033)	(0.037)	(0.053)	(0.026)	(0.039)
First-stage F-stat.	1019	862.9	1019	862.9	1079	578.5	1079	578.5
Observations	307,870	307,870	307,870	307,870	102,667	102,667	102,667	102,667
<b>35-54</b>								
Refugees/pop.	-0.081*	-0.083	0.042*	0.037	-0.008	0.003	0.011	0.049
	(0.046)	(0.057)	(0.025)	(0.029)	(0.049)	(0.077)	(0.028)	(0.041)
First-stage F-stat.	933.1	812.1	933.1	812.1	867.4	605.5	867.4	605.5
Observations	284,047	284,047	284,047	284,047	76,932	76,932	76,932	76,932
<b>55-64</b>								
Refugees/pop.	0.194	0.288	0.010	-0.065	0.201	0.351**	-0.126	-0.222**
	(0.185)	(0.255)	(0.105)	(0.151)	(0.135)	(0.160)	(0.080)	(0.087)
First-stage F-stat.	930.1	787.3	930.1	787.3	647.4	528	647.4	528
Observations	14,857	14,857	14,857	14,857	15,309	15,309	15,309	15,309
<b>LOW EDUCATION</b>								
Refugees/pop.	0.027	0.062**	0.001	-0.018**	0.030*	0.077***	0.008	0.018
	(0.019)	(0.026)	(0.006)	(0.007)	(0.017)	(0.026)	(0.011)	(0.015)
First-stage F-stat.	1023	859.8	1023	859.8	978.7	602.8	978.7	602.8
Observations	329,258	329,258	329,258	329,258	155,978	155,978	155,978	155,978
<b>HIGH EDUCATION</b>								
Refugees/pop.	0.011	0.069	-0.003	-0.025	0.017	0.073	0.006	0.024
	(0.044)	(0.048)	(0.024)	(0.025)	(0.060)	(0.093)	(0.025)	(0.035)
First-stage F-stat.	902	791.3	902	791.3	805.4	551.5	805.4	551.5
Observations	277,650	277,650	277,650	277,650	39,129	39,129	39,129	39,129
Contols	+	+	+	+	+	+	+	+
Five region x year FE	+	-	+	-	+	-	+	-
NUTS-1 x year FE	-	+	-	+	-	+	-	+

Notes: Each coefficient shows the effect of Syrian refugee/native ratio on required education and undereducation for 2004-19 period. Controls are experience categories, region, occupation, industry, year, education, marital status age group, industry  $\times$  year, firm size, gender, and working in informal employment fixed effects. NUTS-1 or five region  $\times$  year fixed effects are added as shown above. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Standard errors are clustered at NUTS-2  $\times$  year.

**Table 9: Effect of migrant-to-native ratio on required education and undereducation of native women in the formal and informal sectors**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS
	FORMAL SECTOR				INFORMAL SECTOR			
	Req. education		Undereducation		Req. education		Undereducation	
<b>ALL SAMPLE</b>								
Refugees/pop.	-0.036	-0.105	0.097*	0.188***	0.057	-0.034	-0.018	-0.000
	(0.079)	(0.103)	(0.050)	(0.060)	(0.052)	(0.055)	(0.034)	(0.036)
First-stage F-stat.	701.4	562.3	701.4	562.3	592	455.1	592	455.1
Observations	159,744	159,744	159,744	159,744	65,857	65,857	65,857	65,857
<b>18-34</b>								
Refugees/pop.	-0.024	-0.075	0.125**	0.229***	0.001	-0.268**	0.079	0.230***
	(0.075)	(0.088)	(0.060)	(0.064)	(0.115)	(0.131)	(0.079)	(0.087)
First-stage F-stat.	714.4	567.2	714.4	567.2	618.1	450.3	618.1	450.3
Observations	95,858	95,858	95,858	95,858	30,047	30,047	30,047	30,047
<b>35-54</b>								
Refugees/pop.	-0.091	-0.255	0.075	0.168	0.116*	0.161*	-0.063*	-0.101**
	(0.155)	(0.202)	(0.084)	(0.106)	(0.062)	(0.085)	(0.037)	(0.050)
First-stage F-stat.	605.2	465	605.2	465	539	418	539	418
Observations	61,909	61,909	61,909	61,909	30,757	30,757	30,757	30,757
<b>55-64</b>								
Refugees/pop.	-1.387	-0.899	0.923	0.686	-0.096	-0.130	0.017	0.047
	(1.282)	(1.583)	(0.631)	(0.784)	(0.065)	(0.084)	(0.041)	(0.059)
First-stage F-stat.	230.8	195.9	230.8	195.9	340.1	245.9	340.1	245.9
Observations	1,685	1,676	1,685	1,676	4,725	4,714	4,725	4,714
<b>LOW EDUCATION</b>								
Refugees/pop.	0.158*	0.257**	-0.014	-0.050	0.029	-0.012	0.017	0.003
	(0.086)	(0.102)	(0.033)	(0.033)	(0.036)	(0.044)	(0.018)	(0.022)
First-stage F-stat.	784.5	733.1	784.5	733.1	601.8	476.9	601.8	476.9
Observations	62,739	62,739	62,739	62,739	52,884	52,884	52,884	52,884
<b>HIGH EDUCATION</b>								
Refugees/pop.	0.040	0.056	0.009	0.020	-0.020	-0.188	-0.034	0.010
	(0.081)	(0.096)	(0.035)	(0.038)	(0.118)	(0.141)	(0.047)	(0.057)
First-stage F-stat.	646.1	470.6	646.1	470.6	463.5	357.5	463.5	357.5
Observations	96,855	96,855	96,855	96,855	12,773	12,773	12,773	12,773
Controls	+	+	+	+	+	+	+	+
Five region x year FE	+	-	+	-	+	-	+	-
NUTS-1 x year FE	-	+	-	+	-	+	-	+

Notes: Each coefficient shows the effect of Syrian refugee/native ratio on required education and undereducation for 2004-19 period. Controls are experience categories, region, occupation, industry, year, education, marital status age group, industry  $\times$  year, firm size, gender, and working in informal employment fixed effects. NUTS-1 or five region  $\times$  year fixed effects are added as shown above. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Standard errors are clustered at NUTS-2  $\times$  year.

**Table 10: Effect of migrant-to-native ratio on employment of native men in the formal and informal sectors by different sub-samples**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	OLS	2SLS	2SLS	OLS	OLS	2SLS	2SLS
	FORMAL SECTOR				INFORMAL SECTOR			
<b>ALL SAMPLE</b>								
Refugees/pop.	0.116*** (0.033)	0.197*** (0.047)	0.112*** (0.038)	0.170*** (0.054)	-0.234*** (0.031)	-0.220*** (0.041)	-0.209*** (0.032)	-0.186*** (0.042)
First-stage F-stat.			953.3	764.4			953.3	764.4
Observations	1,946,202	1,946,202	1,946,202	1,946,202	1,946,202	1,946,202	1,946,202	1,946,202
<b>18-34</b>								
Refugees/pop.	0.008 (0.042)	0.206*** (0.057)	0.048 (0.045)	0.189*** (0.064)	-0.263*** (0.049)	-0.288*** (0.060)	-0.249*** (0.051)	-0.269*** (0.064)
First-stage F-stat.			1033	756.5			1033	756.5
Observations	822,513	822,513	822,513	822,513	822,513	822,513	822,513	822,513
<b>35-54</b>								
Refugees/pop.	0.182*** (0.054)	0.230*** (0.068)	0.176*** (0.060)	0.206*** (0.079)	-0.205*** (0.032)	-0.187*** (0.046)	-0.182*** (0.034)	-0.148*** (0.047)
First-stage F-stat.			934.7	779.7			934.7	779.7
Observations	829,328	829,328	829,328	829,328	829,328	829,328	829,328	829,328
<b>55-64</b>								
Refugees/pop.	0.126*** (0.036)	0.022 (0.041)	0.009 (0.033)	-0.025 (0.037)	-0.061** (0.029)	0.003 (0.036)	-0.038 (0.031)	0.044 (0.040)
First-stage F-stat.			828.1	695.5			828.1	695.5
Observations	294,361	294,361	294,361	294,361	294,361	294,361	294,361	294,361
<b>LOW EDUCATION</b>								
Refugees/pop.	0.116*** (0.041)	0.211*** (0.053)	0.106** (0.043)	0.200*** (0.059)	-0.284*** (0.040)	-0.285*** (0.050)	-0.264*** (0.040)	-0.261*** (0.050)
First-stage F-stat.			1014	757.1			1014	757.1
Observations	1,260,107	1,260,107	1,260,107	1,260,107	1,260,107	1,260,107	1,260,107	1,260,107
<b>HIGH EDUCATION</b>								
Refugees/pop.	0.072 (0.044)	0.123* (0.068)	0.073 (0.053)	0.070 (0.078)	-0.042* (0.022)	-0.011 (0.033)	-0.009 (0.026)	0.037 (0.037)
First-stage F-stat.			847.2	750.1			847.2	750.1
Observations	686,095	686,095	686,095	686,095	686,095	686,095	686,095	686,095
Controls	+	+	+	+	+	+	+	+
Five region x year FE	+	-	+	-	+	-	+	-
NUTS-1 x year FE	-	+	-	+	-	+	-	+

Notes: Each coefficient shows the effect of Syrian refugee/native ratio on employment status for 2004-19 period. Controls are, region year, education, marital status, age group, gender. NUTS-1 or five region × year fixed effects are added as shown above. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Standard errors are clustered at NUTS-2 × year.

**Table 11: Effect of migrant-to-native ratio on employment of native women in the formal and informal sectors by different sub-samples**

	(1)(2)	(3)	(4)	(5)(6)	(7)	(8)		
	OLSOLS	2SLS	2SLS	OLSOLS	2SLS	2SLS		
FORMAL SECTOR	INFORMAL SECTOR							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	OLS	2SLS	2SLS	OLS	OLS	2SLS	2SLS
	FORMAL SECTOR				INFORMAL SECTOR			
<b>ALL SAMPLE</b>								
Refugees/pop.	-0.046**	-0.114***	-0.086***	-0.128***	0.028	0.055*	0.061***	0.081***
	(0.019)	(0.025)	(0.023)	(0.027)	(0.020)	(0.028)	(0.023)	(0.029)
First-stage F-stat.			920.5	744.1			920.5	744.1
Observations	2,124,223	2,124,223	2,124,223	2,124,223	2,124,223	2,124,223	2,124,223	2,124,223
<b>18-34</b>								
Refugees/pop.	-0.022	-0.098***	-0.065**	-0.126***	0.017	0.038	0.045*	0.062**
	(0.023)	(0.034)	(0.028)	(0.038)	(0.021)	(0.029)	(0.024)	(0.031)
First-stage F-stat.			996.5	726.7			996.5	726.7
Observations	886,247	886,247	886,247	886,247	886,247	886,247	886,247	886,247
<b>35-54</b>								
Refugees/pop.	-0.114***	-0.223***	-0.189***	-0.263***	0.058**	0.076**	0.087***	0.102***
	(0.033)	(0.041)	(0.038)	(0.041)	(0.025)	(0.037)	(0.028)	(0.038)
First-stage F-stat.			892.2	756			892.2	756
Observations	915,153	915,153	915,153	915,153	915,153	915,153	915,153	915,153
<b>55-64</b>								
Refugees/pop.	0.019*	-0.019*	-0.001	-0.015	0.023	0.047*	0.045**	0.069***
	(0.010)	(0.011)	(0.009)	(0.011)	(0.020)	(0.025)	(0.022)	(0.026)
First-stage F-stat.			828.6	695.4			828.6	695.4
Observations	322,823	322,823	322,823	322,823	322,823	322,823	322,823	322,823
<b>LOW EDUCATION</b>								
Refugees/pop.	-0.052***	-0.131***	-0.088***	-0.140***	0.020	0.052*	0.052**	0.081***
	(0.018)	(0.023)	(0.020)	(0.023)	(0.020)	(0.028)	(0.023)	(0.030)
First-stage F-stat.			993.5	762.9			993.5	762.9
Observations	1,604,772	1,604,772	1,604,772	1,604,772	1,604,772	1,604,772	1,604,772	1,604,772
<b>HIGH EDUCATION</b>								
Refugees/pop.	-0.024	-0.013	-0.027	-0.035	0.039	0.046	0.060**	0.055
	(0.036)	(0.053)	(0.041)	(0.058)	(0.024)	(0.032)	(0.028)	(0.036)
First-stage F-stat.			722.9	627.4			722.9	627.4
Observations	519,451	519,451	519,451	519,451	519,451	519,451	519,451	519,451
Controls	+	+	+	+	+	+	+	+
Five region x year	+	-	+	-	+	-	+	-
FE								
NUTS-1 x year FE	-	+	-	+	-	+	-	+

Notes: Each coefficient shows the effect of Syrian refugee/native ratio on employment status for 2004-19 period. Controls are, region year, education, marital status, age group, gender. NUTS-1 or five region × year fixed effects are added as shown above. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Standard errors are clustered at NUTS-2 × year.