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Blessing or burden? Impacts of refugees on businesses and the informal economy☆

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ABSTRACT

We study the impact of the sudden arrival of more than three million Syrian refugees in Turkey on Turkish businesses. Our empirical methodology exploits the annual variation in refugee outflows from Syria and geographic concentrations of Arabic-speaking communities in Turkey, which date back to the rupture of the Ottoman Empire after World War I. Using yearly firm census data from 2006 to 2015, we document that refugee inflows induced a positive impact on the intensive and extensive margins of firm production. The effects were stronger for smaller firms and for firms operating in the construction and hospitality sectors. Increased informal activity by firms drove most of these changes.

1. Introduction

By the end of 2018, conflict and violence had forcibly displaced 70.8 million people around the globe, an all-time high in the modern history of humanity (UNHCR, 2018). The economic consequences of forced displacement are likely to differ from those caused by voluntary migration. Refugees, for instance, arrive in large numbers and vulnerable conditions, are traumatized by war, and lose any assets that they cannot transfer to the host country. Most often, the lack of clear regulation of their status, coupled with uncertainty regarding the duration of their stays, further complicates their integration into local economies and restricts their human capital investments. Given that 85% of refugee populations find shelter in developing countries (UNHCR, 2018), their

employment opportunities are usually concentrated in the informal sector. Large inflows of refugees, consequently, may propagate profound economic shocks in host economies, through changes in production and prices and by inducing changes in the informal economic activities.

We study the effects of the inflows of more than 3 million Syrian refugees into Turkey on Turkish firms' behavior, including input demands, production, and entry/exit decisions. Our analysis includes heterogeneous effects of refugee migration on firms' decisions, by size and economic sector. Our examination accounts for the possibility that formal firms may under-report production and sales to reduce their tax burdens. We do this by investigating the effects of refugee inflows on meter-based measures of energy consumption. These measures enable us to document changes in firm behavior that are not observed via official sales and

production figures. Additionally, using detailed data on capital structure, we analyze to what extent entrepreneurial capacity moves from the refugee's home to the host country.

We combine multiple data sources to conduct our empirical analysis. These sources include annual censuses of firms, labor force surveys, business registrations, and trade statistics, as well as the official population and migration figures between 2006 and 2015. We also complement the quantitative analysis with findings from face-to-face interviews with business owners and refugees.

To causally identify the effects of refugee inflows on firm behavior, we compare firm outcomes in provinces with different shares of historical settlements of Arabic speakers before and after the onset of the conflict. The empirical strategy exploits the geographic distribution of Arabic-speaking networks in Turkey, which date back to the Ottoman Empire. Following its collapse, the Treaty of Lausanne in 1923 ceded a large share of the Ottoman Province of Aleppo (*Halep Vilayeti*), a region with a dense population of ethnic Arabs, to newly founded Turkey. Despite negligible migration from Syria to Turkey during the following decades, these regions were substantially more likely to receive Syrian refugees after the onset of the conflict. In our empirical approach, we rely on this historical episode to design an instrumented difference-in-differences approach. In particular, our instrument is constructed as the interaction of the historical distribution of Arabic-speaking populations in Turkey in 1965[1] and the yearly outflow of individuals who left Syria.

We document positive effects of the influx of refugees on firms' intensive and extensive margins of production. The effect sizes are economically meaningful: a one-percentage-point increase in the share of refugees to total population boosts a firm's electricity and oil consumption by 4.3%. These effects are entirely driven by small-to medium-sized firms and more pronounced among those operating in the construction, restaurant, and hotel sectors. We also find that the refugee arrival substantially increased the number of new firms, especially those with foreign ownership. The data indicate that a significant part of these newly established firms are co-owned by Syrian partners, who possibly collaborated with Turkish peers to overcome legal barriers to market entry for foreigners.

Our findings suggest that the impacts of refugee inflows on firms are concentrated in the informal or shadow economy. Using the official census figures that firms report to the government for tax purposes, we do not observe any changes in production, sales, or number of employees. However, we document large increases in energy consumption and firm creation, variables which correct for firm misreporting and account for informal economic activity.[2]

Our analysis using labor force surveys provides one potential mechanism to explain our results. Among native male workers, who constitute 75% of the employed labor force in our sample, a one-percentage-point increase in refugees in the overall population decreases the likelihood of overall employment by 0.3 percentage points. We show that these effects are entirely driven by the loss of employment in the informal labor market among native workers. Those who stay employed also witness a 0.4% marginal increase in their wages and work longer hours. These results suggest that refugees replaced native workers in the informal labor market, thus increasing the competition for low-wage jobs and potentially reducing labor costs for firms.

Overall, our results indicate that refugee inflows have a positive impact on local businesses and firm creation, but these effects are concentrated in the informal economy and coupled with reduced

employment for native workers in the informal labor market. In the set of outcomes that we analyze, the estimated effects emerge with the arrival of Syrian refugees. Moreover, outcome trends during the pre-exposure period are remarkably similar across provinces with different historical settlements of Arabic speakers.

We contribute to two strands of literature. First, we present evidence on how unskilled migration shocks impact a developing host country with limited institutional infrastructure and a large informal sector. Previous studies examining the impacts of migrants on firm-level outcomes primarily focus on developed countries and voluntary migrants.[3] These studies conclude that unskilled migration improves firm-level productivity through lower production costs and skill complementarities at the work place,[4] whereas the estimated impacts on capital investments are mixed.[5]

Our second contribution is to the literature that studies the impact of refugee inflows. Most of these studies focus on labor market effects of historical refugee shocks,[6] without a consensus on the direction of their impacts.[7] For instance, using Turkish labor force surveys, recent work examines the impact of Syrian refugee inflows on the Turkish labor market.[8] These studies[9] consistently find that larger refugee inflows induced a reduction in employment of Turkish male workers in the informal labor market.[10] We use the same data to explore the mechanisms driving our main results and document that firms hire refugees informally.

Within the group of studies exploring the impacts of refugee migration, a closely related analysis is that of Akgündüz et al. (2018), who use province-level aggregate data to investigate the effects of Syrian refugees on firm entry, sales, and profits. They find positive effects of refugee inflows on firm creation, especially those that are established with foreign capital. The study also provides suggestive evidence on increased gross profits and sales. Another related study is Cengiz and Tekgüç (2018), who document similar increases in firm creation, especially in

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[3] See for example for Spain; Lewis (2011), Ghosh et al., 2014, and Kerr et al. (2015) for the United States; Accetturo et al. (2012) for Italy; Ottaviano et al. (2018) for the United Kingdom; and Dustmann and Glitz (2015) for Germany.

[4] Studies examining the impacts of immigration on firm outcomes find that highly skilled immigrants are associated with higher productivity (Ghosh et al., 2014), employment expansion of skilled natives (Kerr et al., 2015), and large complementarities between technology and migrants (Paserman, 2013).

[5] For example, Lewis (2011) finds that plants in areas that received unskilled immigrants were less likely to adopt automation machinery, which can buffer the effects of immigration on wages. In contrast, Accetturo et al. (2012) and Ottaviano et al. (2018) find that firms in Italy and the United Kingdom increase their capital investments in response to immigration from developing countries, arguably because firms tend to offset the skill-downgrading effects with increased capital accumulation. The latter also finds that immigration acts as a substitute for offshoring by lowering the intermediate imports from the immigrants' countries of origin. In this way, immigration tends to increase exports to the immigrants' countries of origin, because it helps reduce information barriers and trade costs. Finally, Dustmann and Glitz (2015) find that the responses of firms to an influx of immigrants in Germany depend on their sector of economic activity: firms in the non-tradable sector respond by lowering wages, and their counterparts in the tradable sector respond by scaling up their employment and changing their skill mix. The authors also find a positive net entry effect of firms in the tradable sector.

[6] A few notable exceptions are Alix-Garcia and Saah (2009) and Alix-Garcia et al. (2018), who study the impacts of refugees camps in economic activity, including night-light density and prices.

[7] See Clemens and Hunt (2019) and Borjas and Monras (2017) for a review of this literature.

[8] See Ceritoglu et al., 2017; Del Carpio and Wagner (2015); Cengiz and Tekgüç (2018) and Aksu et al. (2018) for examples.

[9] Excluding Cengiz and Tekgüç (2018), who do not report their findings by gender.

[10] Results on the effects of refugee inflows on other demographic groups vary by identification strategy, study period, and the way that each study accounts for differential existing trends in outcomes (Aksu et al., 2018).

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[1] 1965 is the last census in which we observe the number of Turkish citizens, by mother language, in a given province.

[2] In this paper, we define informality as all economic activities that are hidden from official authorities. The most common forms of informality in Turkey are revenue underreporting and non-registration of workers (World Bank, 2010). Importantly, firm informality is not a binary variable. Many firms avoid tax burdens by not declaring part of their activity and employees to authorities.
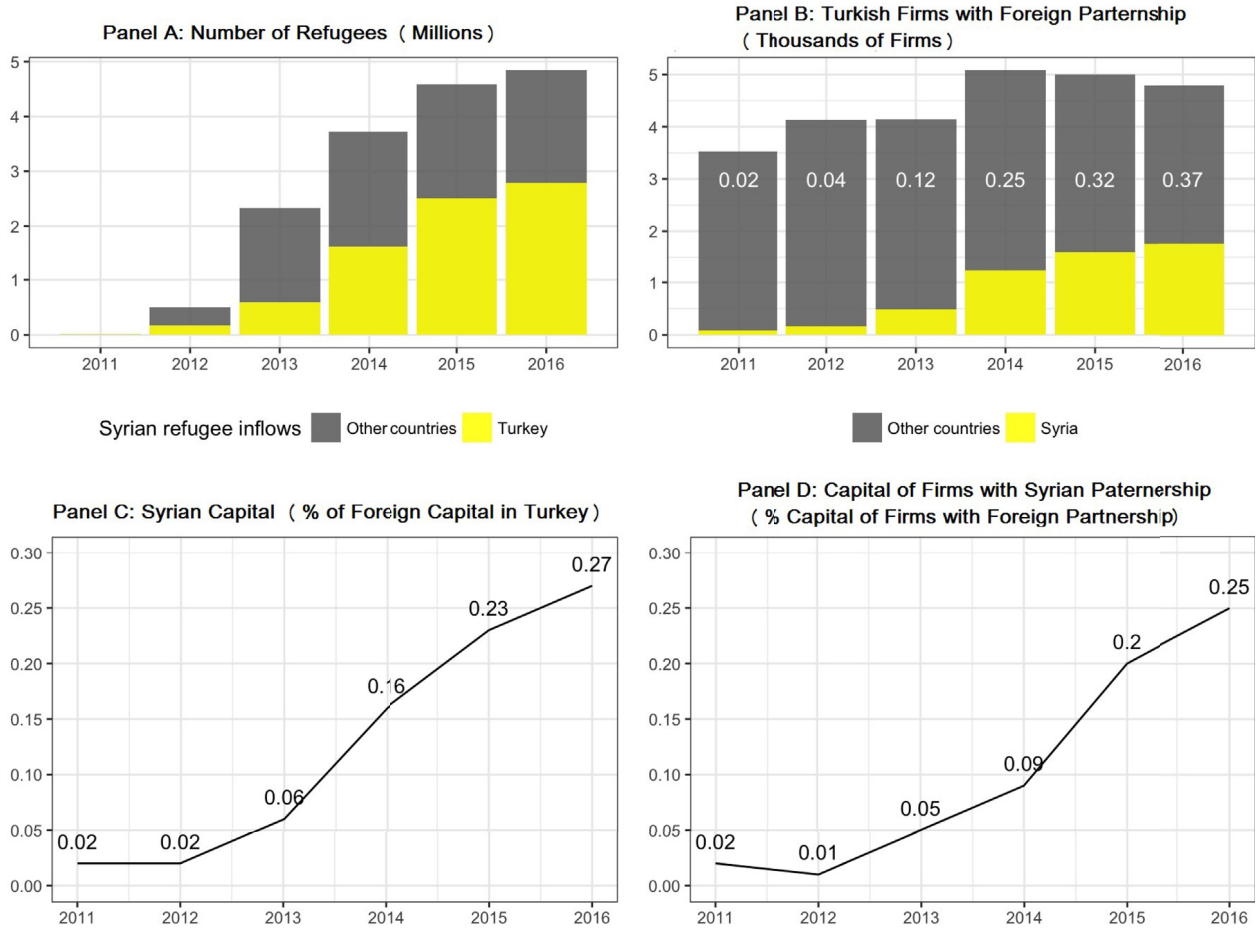
Fig. 1. Syrian Presence in Turkey, 2011–2016.
Data Sources: DGMM refugee data (panel A), TOBB data (panels B to D).

the construction industry.

We complement these studies by exploiting a historic natural experiment and employing firm-level census data to examine the effects of refugee migration on firm behavior. Our data allow us to examine the effects of refugee migration on additional firm decisions not yet studied, including input demands, trade, and energy consumption. The latter has the unique feature of solving concerns related to under-reporting of sales and profits in official firm figures. The data we use also enable a detailed subgroup analysis of the effects of refugee inflows by firm size and industry.

Overall, our analysis is informative on the economic consequences of hosting refugees, especially in developing countries with similar inflows that may not have comparable rich data to conduct similar analyses.

2. Background

The Syrian Civil War started when Bashar Al-Assad's regime showed a disproportionate response to peaceful protests in early 2011. Violence escalated rapidly and spread throughout Syria, causing a severe humanitarian crisis. As of 2017, approximately 12 million individuals, roughly half of the Syrian pre-war population, have left the conflict areas. Among them, 6 million people sought shelter outside Syria, primarily in neighboring countries (UNHCR, 2018). Turkey has become the primary destination for refugees from the Syrian Civil War, and more than 3.5 million individuals have resettled there under a temporary protection regime.

The initial waves of refugees began arriving in Turkey in the second half of 2011, and small numbers of refugees continued to arrive until

mid-2012 (İçduygu, 2015). In the following months, there was a substantial and long-lasting increase in the number of Syrian families seeking shelter at the Turkish-Syrian border. According to official data from the United Nations Refugee Agency (UNHCR), the total number of refugees who arrived in Turkey was only around 170,000 in 2012 and increased to over half a million in 2013. Refugee inflows intensified with the increasing presence of ISIS in northern Syria, reaching 1.6 million in 2014 and more than 2.5 million in 2015. As of 2017, 3.1 million Syrians were registered in Turkey, accounting for nearly 4% of the country's population.

Initially, the Turkish government made an effort to host the displaced population in 25 refugee camps in the southern part of the country near the Turkish-Syrian border. These camps quickly exceeded their capacity when conflict intensified in Syria, and currently only around 8.2% of the refugee population lives in the camps (European Commission, 2017). Most of the refugee population in Turkey is dispersed across urban areas (Erdoğan, 2017).

Legal regulations in Turkey concerning the population displaced by the Syrian Civil War are based on the 1951 Geneva Convention. However, despite signing the convention, Turkey does not officially recognize non-European citizens as asylum seekers, irrespective of their motive (Erdoğan, 2017). Syrian citizens in Turkey are under "temporary protection", which permits freedom of movement and access to health care and education. According to this regulation, there were no restrictions on refugee movement within Turkey during the study period, and Syrian citizens had legal access to free health care and basic education. In practice, a lack of clear regulation, available supply, and formal procedures restricted their access to these services (İçduygu and Şimşek,
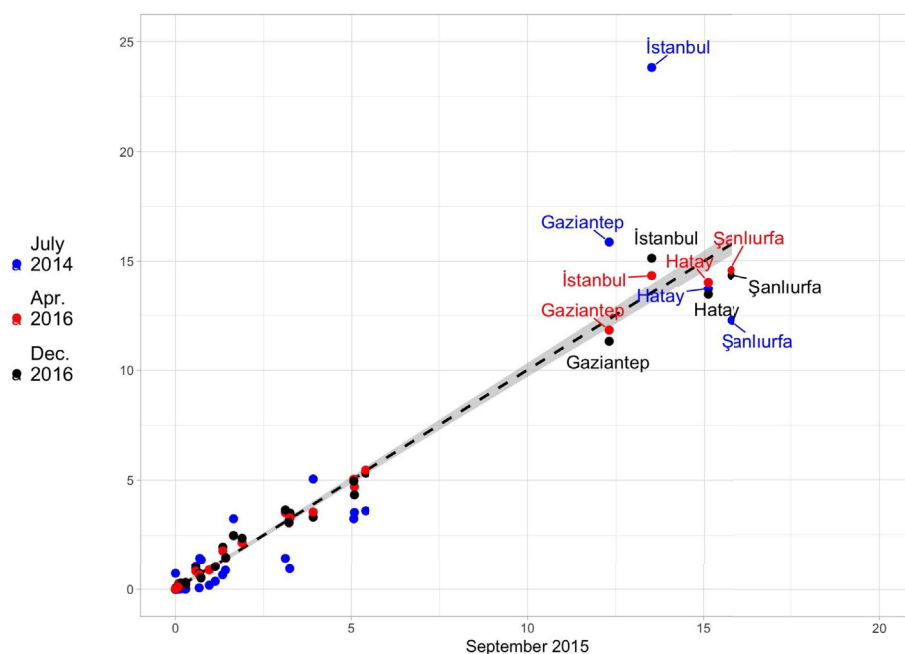
Notes: Total refugee population was normalized to 100 for each period.

Fig. 2. Time Persistence of Refugee Inflows into Turkish Provinces - DGMM refugee data.

2016). The temporary protection regime does not offer work authorization; thus, the vast majority of Syrians in the Turkish labor force work in the informal labor market (Durukan, 2015).[11]

2.1. Characterizing Syrian refugees

Aggregate data from UNHCR suggest that the refugee population in Turkey is balanced by gender, relatively uneducated, and young, with 45% of the population under 18 years of age (see the descriptive statistics in Appendix I).

As of today, there are no representative surveys of the Syrian refugee labor force in Turkey. However, qualitative evidence suggests that Syrian refugees are likely to be employed in informal, low-wage jobs in agriculture, construction, manufacturing, and service industries (Erdoğan, 2017; Erdoğan and Unver, 2015). Anecdotal evidence also suggests that Syrian child labor is a significant part of the new work force, especially in the manufacturing industry.[12]

Other insights on the Syrian refugee labor force can be obtained from a 2017 non-random survey conducted in Istanbul among 1,003 Syrian refugee workers between 18 and 29 years of age. The survey suggests that young refugees are typically employed in wholesale and retail sales (22.4%), textile and apparel (17.7%), and accommodation and food services (17.1%).[13] The sectors that create most jobs for Turkish workers are similar.[14] The survey also shows that young Syrians are typically employed at small firms.

When comparing the sample of Syrian refugee workers to the population of Turkish workers (all living in Istanbul and between 18 and 29 years of age), we observe that Syrian refugees have lower education levels (only 24% had more than high school, relative to 50.6% of Turkish

nationals), are disproportionately male (80% vs. 60% of natives), and face higher unemployment rates (48.2% vs. 19.3% of the native population). Additionally, Syrian refugee workers, on average, receive lower wages and work more hours relative to young Turkish citizens.[15]

3. Data

3.1. Refugees inflows

We employ two sources of refugee data in our analysis. Aggregate figures on the total refugee outflows from Syria and inflows from Syria to Turkey come from UNHCR and are available for 2011–2016, covering the entire conflict period. We aggregate these figures annually over the study period (see Fig. 1). Province figures on the registered refugee population come from the Directorate General of Migration Management (DGMM), the Turkish migration authority. DGMM data on the number of refugees at the province level is available only for three time periods: September 2015, April 2016, and December 2016. The Turkish government also released some estimates on province-level refugee populations in August 2014. We collected these data from the newspapers that published the information.[16] Fortuitously, the geographic dispersion of refugees in Turkey was remarkably stable over time, which allows us to estimate the yearly inflows at the province level by using the aggregate figures.

Fig. 2 compares the province-level DGMM numbers after normalizing the overall refugee population to 100 for each period. It strongly suggests that refugees consistently moved to the same provinces, despite a substantial increase in the overall refugee population, with all the provinces tightly clustered around a 45-degree diagonal area. Istanbul stands out as an outlier in August 2014, as discussed in the empirical section, however, excluding it from our estimates has no impact on our results. Given the persistent distribution of refugees, we use the September 2015 shares to construct the refugee annual-province figures as

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[11] As of September 2015, only 6000 Syrians effectively received legal work permits (Hurriyet, 2015).

[12] See, for example, the BBC (2016) media report on Syrian child labor.

[13] See IYF (2018) for technical details on the survey.

[14] According to the Turkish labor force surveys of 2017, the five sectors that create more than 60% of employment for Turkish nationals are manufacturing; wholesale and retail; professional, scientific, and technical activities; accommodation and food services; and construction.

[15] For instance, the average wage of a young Syrian in Istanbul is 1492 Turkish Liras, compared with 1882 Turkish Liras received by a young Turkish citizen.

[16] See Habeturk (2014) for examples of news outlets that published these data.
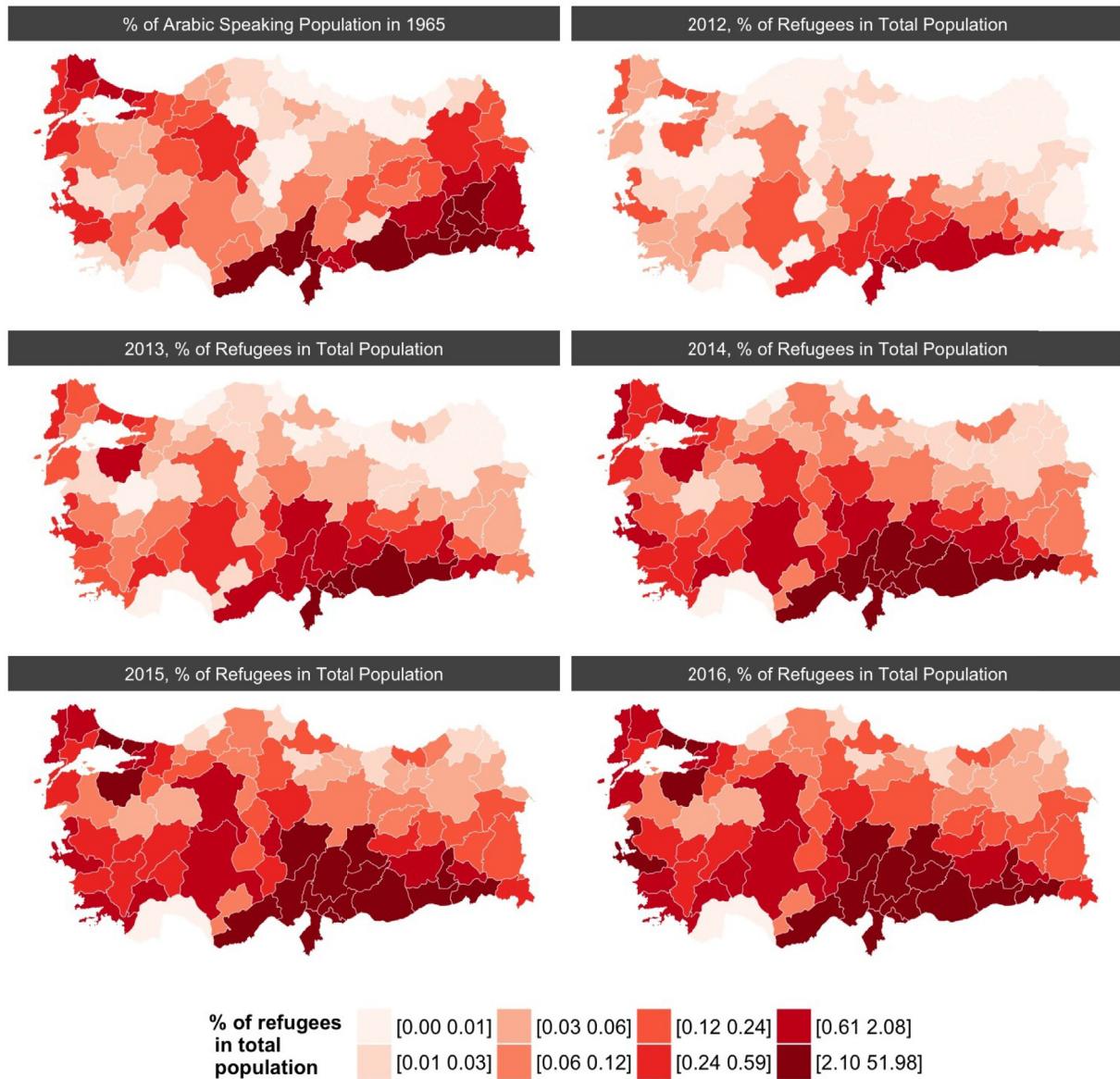
Fig. 3. Location of Refugees and Arabic-speaking Populations in Turkey - DGMM refguee data.

$$\text{Refugee Population}_{pt} = \text{Refugee Share}_{p,\text{Sept. 2015}} \text{ x } \text{Refugee Population}_t \tag{1}$$

where Refugee Population$_{pt}$ stands for our constructed measure of the refugee population in province *p* and year *t*, Refugee Share$_{p,\text{Sept. 2015}}$ is the proportion of refugees received in province p as of September 2015, and Refugee Population$_t$ is the total number of refugees who arrived in Turkey at the end of year *t*. Appendix III shows the constructed measure and the observed data for September 2015, showing that our constructed measure of refugee inflows closely approximates the exact values of refugee inflows during the same period. It is important to note that the official numbers released by DGMM reflect the number of registered refugees in each province. Refugees might have left the provinces after

registration, moving either to another location or out of the country. Thus, the measurement error in the local inflow intensity variable is an important drawback that we attempt to offset by using a more precisely measured instrument.

Using the constructed measure of the refugee population illustrated in equation (1), we estimate the province-year share of refugees as a percentage of the total population as

$$\text{PctRef}_{pt} = \frac{\text{Refugee Population}_{p,t}}{\left[\text{Refugee Population}_{p,t} + \text{Turkish Population}_{p,t}\right]} \text{ x } 100 \tag{2}$$

where *PctRef$_{pt}$* is the variable we use in our estimates.

3.2. Firm data

In our main estimates, we use the Annual Industry and Service Statistics (AISS) survey produced by the Turkish Statistical Institute (TurkStat) between 2003 and 2015. The AISS survey is a census of firms with at least 20 employees.[17] As the AISS survey data between 2003 and 2005 are generally regarded as less reliable, we focus on 2006–2015.[18] The unit of analysis in the AISS survey is the firm and not the plant.

The AISS survey includes information on all economic sectors,[19] nominal sales, gross production (defined as sales plus change in inventories), value added, investment, costs, energy consumption, employment (divided in paid and unpaid workers),[20] labor expenses, and headquarters location by province. Although we do not observe the firm's capital demand directly, we impute it to each firm based on their reported depreciation levels.[21]

Given that we observe only the location of the headquarters of each firm, in our main analysis, we use the province of the headquarter as the operating region, assuming that all subsidiary plants are located within the same province. In the robustness analysis, we restrict the sample to firms with a single plant to test the sensitivity of our results to this assumption. We present the aggregate time trends for our outcomes in Appendix II.

3.3. Other data sources

We use five additional sources of information. First, data on Turkish citizen's labor outcomes come from the annual Household Labor Force Surveys, which are available between 2004 and 2016 and collected by TurkStat. We focus on the period between 2005 and 2016 due to quality concerns related to the 2004 wave.[22]

These repeated cross-sectional surveys represent the working-age Turkish population at the regional level and include a rich set of demographic variables in addition to detailed information on labor supply status. Population figures of Turkish citizens also come from TurkStat for each year and province during our period of analysis.

Our third source of information is the Turkish Population Census of 1965, which we employ to construct our instrument. The census includes information on the mother language of each individual at the province level. To our knowledge, this is the latest publicly available census with this information.[23]

Our fourth source of data is yearly, province-level statistics on exports and imports, available from TurkStat between 2002 and 2017. The foreign trade figures include all international registered trade transactions by firms of any size.

Our fifth source of information is the Company Establishment and Liquidation Statistics published by the Union of Chambers and Commodity Exchanges of Turkey (TOBB) between 2010 and 2017. These statistics include information on all formal firms created in Turkey, regardless of their size. Specifically, we use information on the number of new and existing firms, their ownership structure, and the annual amount of foreign capital for newly created firms.[24]

4. Empirical strategy

The context of Syrian refugee inflows in Turkey has appealing features for a *causal* research design. Syrian migration to Turkey was negligible before the Syrian Civil War began, and the ensuing large-scale migration was unexpected. As such, the timing and the scale of the migration were arguably exogenous to the overall economic conditions in Turkey. Moreover, the incoming refugee population was more likely to settle in locations with ethnic linkages, namely to regions with a higher share of Arabic-speaking populations, generating substantial geographic variation in exposure to refugee inflows across Turkish provinces.

Our empirical strategy relies on comparing firm outcomes in locations that are exposed to larger refugee inflows with those that are not, before and after Syrian Civil War began. Location choice of refugees, however, is a potentially endogenous decision. Time-varying components that we cannot account for might affect both the geographic location pattern and firm behavior. Refugees, for instance, might choose to move to areas where local businesses are more prosperous, which would lead us to overestimate the effects of refugees on firm outcomes. To solve these issues, we estimate the following specification:

$$\ln\left(y_{ipt}\right) = \tau \ \widehat{\text{PctRef}}_{pt} + \gamma_{1p} + \gamma_{1t} + \varepsilon_{1ipt} \tag{3}$$

$$\widehat{\text{PctRef}}_{pt} = \pi \ \text{Predicted Inflows}_{pt} + \gamma_{2p} + \gamma_{2t} + \varepsilon_{2pt} \tag{4}$$

where p stands for the province and t for year; y represents the outcome for firm i including gross production, sales, oil and energy consumption, labor and capital demand, and average wages; PctRef_{pt} is the population share of refugees in province p in year t, constructed using equation (2). In both equations, γ_p and γ_t account for province and year fixed-effects. The standard errors are clustered at the province level to account for the time serial correlation in outcomes across provinces.

Following Altindag and Kaushal (2020), we define Predicted Inflows$_{pt}$ as

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[17] The AISS survey also includes a representative sample of firms with less than 20 employees collected using stratified sampling based on economic activity, size groups, and regions. However, we employ only census data in our analysis.

[18] Between 1980 and 2001, TurkStat collected the Annual Manufacturing Industry Statistics survey, which sampled private manufacturing plants with at least 10 employees and all state-owned plants. Because of incompatibilities with the methodology and definitions of the European Union, TurkStat abandoned this survey in 2002 and began using the AISS survey. The objective was to facilitate international comparisons and ensure compatibility with EU structural business statistics regulations. Unfortunately, implementation and coordination issues between different administrative bodies involved in the data collection and management exercise made the initial years less reliable.

[19] All statistical classification of economic activities in the European Community (NACE Rev.2) sectors except "(A) agriculture, forestry and fishing", "(K) financial and insurance activities", "(O) public administration and defense", "(T) activities of households as employers" and "(U) extra territorial organizations". In 2009, the sector classification of the AISS survey data changed from NACE Rev.1 to NACE Rev.2. Although there is no one-to-one correspondence between these two systems, TurkStat publishes the NACE Rev.2 code for the census part of the AISS survey for the years before 2009.

[20] Unpaid workers are firm owners, partners, unpaid family workers, and apprentices.

[21] Unfortunately, for approximately 40% of the firms reported, depreciation is zero or missing. To solve this is-sue, we predict capital depreciation using sector and year dummies, value added, number of employees, electricity consumption, and oil expenditures.

[22] A major sampling methodology change took place in January 2005, which rendered the survey waves before and after 2005 incomparable.

[23] In 1965, there were 67 provinces in Turkey. Fourteen districts later became provinces, the most recent in 1999. For the provinces established after 1965, we use the percentage of the Arabic population within the 1965 administrative boundaries. For example, Yalova was a district of Istanbul in 1965 and became a province in 1995. We assigned the same percentage of Arabic-speaking populations to Istanbul and Yalova in our analysis.

[24] During the period of study, Syrians could not work legally, but they could co-own firms created with Turkish nationals. They could not be legally employed by those firms, but many worked informally. In fact, informal work arrangements are common among refugees according to the labor force surveys and qualitative accounts. The firms we observe are not informal: they are registered with the Turkish government. However, many of them may under-report their recruitment or sales to reduce their social security and tax burden.

Fig. 4. The Ottoman Empire from 1798 to 1923.
Source: Turkish History. Available at: http://www.worldstatesmen.org/Ottoman.jpg.

$$\text{Pr} \, edicted \, Inflows_{pt} = \left[\frac{Arabic \, Speaking \, Pop_{p,1965}}{Total \, Pop_{p,1965}} \right.$$

$$\left. \times \, Syrian \, Aggregate \, Displacement_t \right] \qquad (5)$$

where Predicted Inflows$_{pt}$ is the interaction of the share of Turkish citizens with an Arabic mother language in 1965 and the total number of individuals displaced outside Syria in year t.

In this framework, year fixed-effects account for aggregate time variation, whereas province fixed-effects purge out the time-invariant differences across areas. Our instrument thus exploits province-year variation and follows the original idea by Card (2001), which suggests that past migration patterns are strong predictors of subsequent migration waves within the same ethnic groups. Note that the instrument in this study is different in that we use the Syrian conflict intensity as a proxy for the within-time variation of the refugee inflows. Further, we use the geographic distribution of Turkish citizens who speak Arabic to predict the geographic resettlement patterns of refugees across Turkish provinces. The latter was not a result of an early migration of Syrian citizens to Turkey, but the outcome of the abrupt ending of the Ottoman Empire, which had a multi-ethnic population that dispersed under many newly founded states after World War I. Moreover, the migration flows from Syria to Turkey were negligible before 2010.
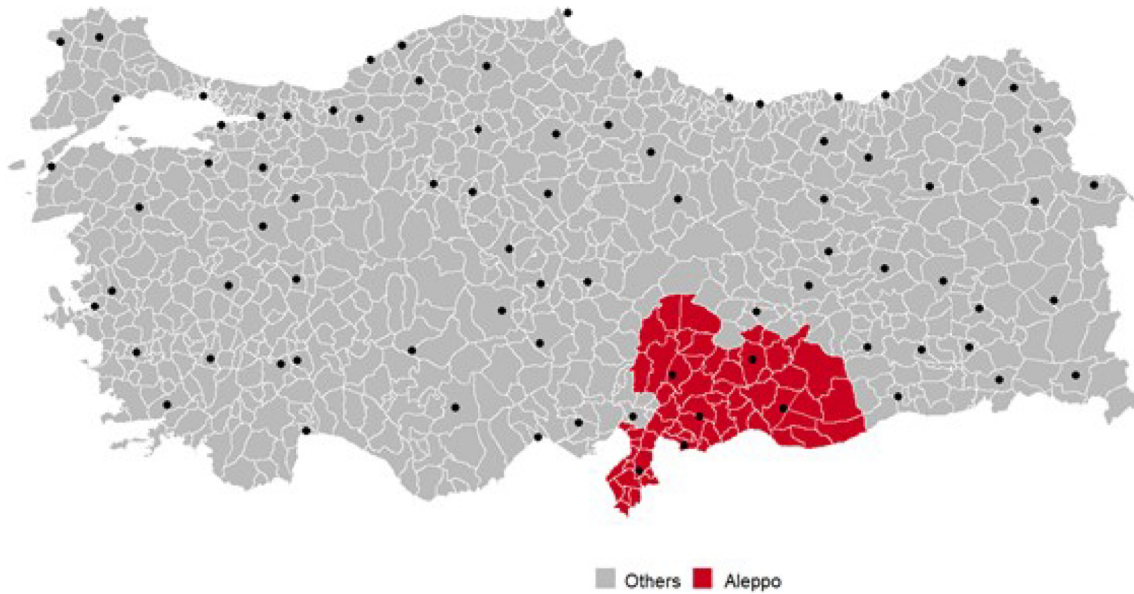
Fig. 5. Ottoman *Vilayet* of Aleppo in Turkey.

Table 1
Effects of refugee inflows on the extensive and intensive margin of production.

Dependent Variable (in logs)	Sales	Gross Production	Electricity	Oil	Number of Firms
	(1)	(2)	(3)	(4)	(5)
Panel A. OLS					
PctRef: Share of Refugees (% Pop)	0.004	0.003	0.014***	0.011*	0.012***
	(0.010)	(0.009)	(0.005)	(0.006)	(0.004)
Adj. R-squared	0.03	0.03	0.03	0.01	0.98
Panel B. Reduced Form					
Predicted Inflows: Syrian Displ. × Share Arabic$_{1965}$	0.004	0.006	0.053***	0.054***	0.054*
	(0.009)	(0.009)	0.019)	(0.020)	(0.028)
Adj. R-squared	0.03	0.03	0.03	0.01	0.98
Panel C. 2SLS					
PctRef: Share of Refugees (% Pop)	0.003	0.005	0.043***	0.043***	0.058*
	(0.008)	(0.008)	(0.016)	(0.016)	(0.035)
Panel D. First Stage Dependent Variable	**PctRef: Share of Refugees (% Pop)**				
Predicted Inflows: Syrian Displ. × Share Arabic$_{1965}$	1.246***	1.246***	1.236***	1.257***	0.945***
	(0.174)	(0.173)	(0.134)	(0.120)	(0.238)
First Stage F-statistic	51.52	51.60 84.97 109.98			15.81
Observations (for all panels)	782,453	781,330 653,027 585,507			810

Notes: All panels include controls for province and year fixed effects. Standard errors clustered at the province level are shown in parentheses. There are 81 clusters in each regression. *Data Source:* AISS.

The identifying assumption is that our instrument should be correlated with the supply-side drivers of labor mobility, such as common language with the host population, but it should not be directly correlated with firm performance.[25] Our instrument supports both claims. First, as illustrated in Fig. 3, the year-to-year geographic distribution of Syrian refugees in Turkey strongly overlaps with the Arabic-speaking regions in Turkey.[26] Second, the interaction of the 1965 Arabic-speaking population share and the worldwide Syrian refugee inflows should not be correlated with the Turkish local business dynamics in any other way except through the Syrian refugee movement, after fully adjusting for the differences across firms in different provinces and the aggregate time trends. Although there is no fully robust test to validate the latter assumption, we regress the outcomes on our instrument using each year of data in the pre-conflict period and estimate a dynamic difference-in-differences model. In particular, for all outcomes, we estimate the following reduced form regression:

$$\ln\left(y_{ipt}\right) = \sum_{j=2006}^{2009} \theta_j\left(year_j \times A_{p,1965}\right) + \sum_{j=2011}^{2015} \theta_j\left(year_j \times A_{p,1965}\right) + \gamma_{3p} + \gamma_{3t} + \varepsilon_{3ipt}$$

(6)

where p stands for province, t for year, and $A_{p,1965}$ is the cross-section component of our instrument: the percentage of Arabic speakers in province p in 1965. $year_j$ represents a year dummy for year j, and γ_{3p} and γ_{3t} account for province and year fixed-effects. We exclude the year 2010, as it marks the beginning of the Syrian Civil War, hence, it is convenient to have it as the baseline comparison year. If the instrument is valid, we expect the interaction terms to fluctuate around zero in the pre-conflict period, suggesting that the instrument is orthogonal to the pre-existing residual trends in firm outcomes.

Estimating equation (6) serves two purposes. First, it allows us to observe, on a yearly basis, if the intensity of Arabic-speaker population shares in 1965 correlates with the firm outcomes before the refugee

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[25] See Imbens and Angrist (1994), Abadie (2003), and Angrist et al. (1996) for a general discussion of the exclusion restriction assumption.
[26] We provide formal evidence on the strength of the correlation between these variables in Table I.
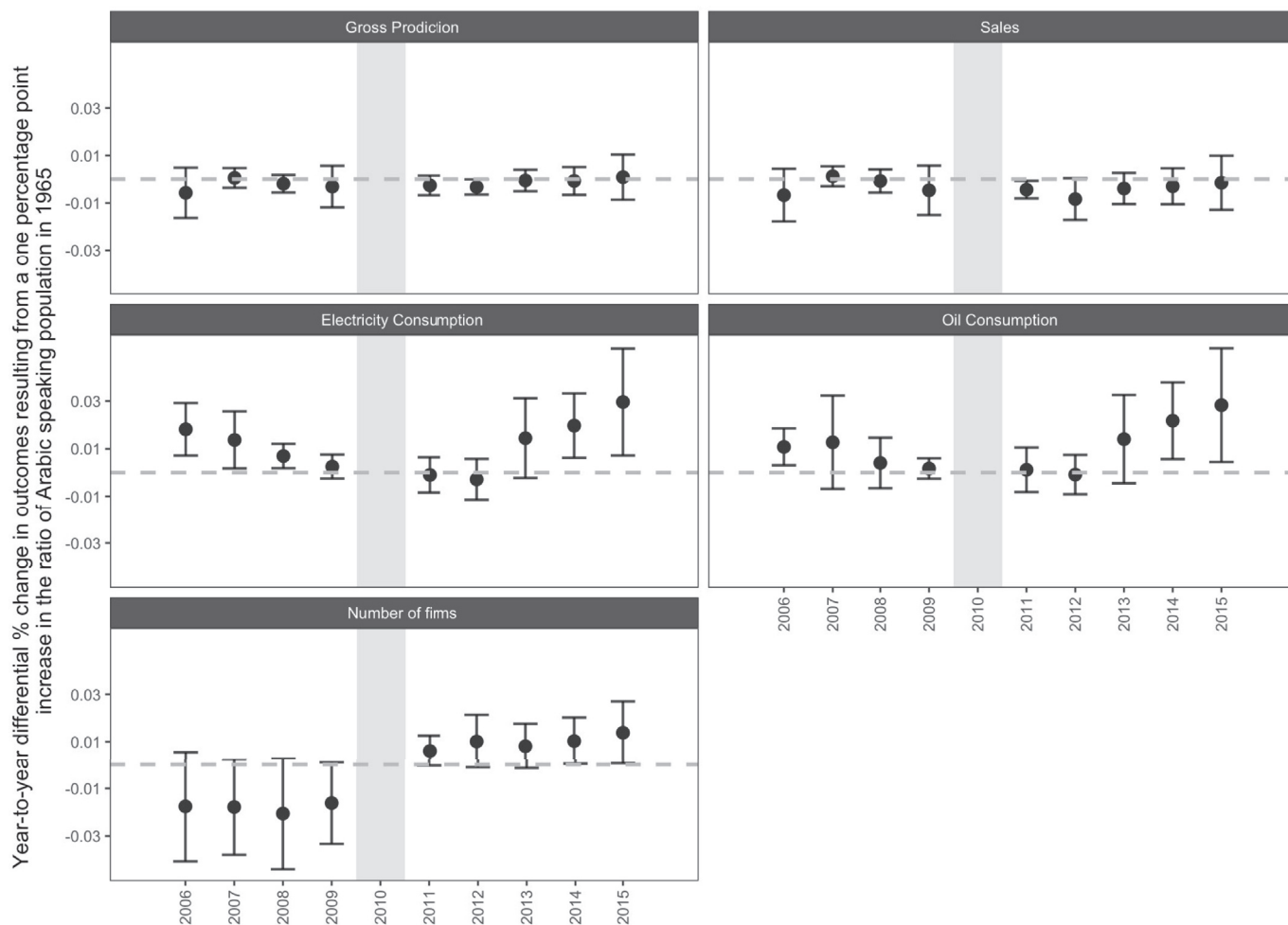
Fig. 6. Difference-in-Differences Annual Estimates, Production - AISS data.

inflows began, which ensures that differential trends in outcomes are not artificially producing the reported results.[27] Second, the reduced-form coefficients in the post-exposure period describe year-to-year changes in outcomes. Thus, if the reduced form identification strategy is correct, we expect any observed impact to emerge following the increase in overall intensity of refugee inflows. We address other potential concerns related to the validity of our empirical strategy in the robustness test section at the end of the paper.

4.1. Historical background of Arabic speakers in 1965

A large share of the Arabic speakers identified in the Turkish 1965 population census descend from populations that survived the collapse of the Ottoman Empire after World War I. The Ottoman Empire was a multi-ethnic, religious, and linguistic state and was governed under the *vilayet* system from 1299 until its collapse in 1922 (see Fig. 4). The *vilayets* were provinces ruled by governors directly appointed by the sultan (Shaw and Shaw, 1976). Centered around the city of Aleppo, the *vilayet* of Aleppo is split across today's northern Syria and southern Turkey (see Fig. 4). According to the 1914 Ottoman population census, the region was populated mainly by Arabic-speaking Muslims (Shaw, 1978). Following the collapse of the Ottoman Empire, the 1923 Treaty of Lausanne ceded a

significant part of the Aleppo *vilayet* to newly founded Turkey, and the southern territories eventually became independent Syria.

Fig. 5 shows the current Turkish region that was part of the Aleppo *vilayet* (circles illustrate the six province centers within this region). As of 1965, the most recent census data that includes information on the mother language of Turkish citizens, around 43% of the population whose mother language was Arabic still lived in the six provinces that were part of the Ottoman Empire.

Although migration from Syria to Turkey was negligible before 2011,[28] the beginning of the conflict initiated a large inflow of immigrants to Turkey whose primary destination was substantially more likely

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[27] In addition to visual inspection, we formally test if the interaction coefficients are jointly equal to zero in the pre-exposure period; that is, we test if the provinces with varying levels of Arabic-speaking populations in 1965 have similar trends in outcomes before the refugee inflows began.

[28] İçduygu and Yükseker (2012) and İçduygu (2013) use historic data from the Bureau for Foreigners, Borders, and Asylum within the Directorate of General Security of the Ministry of the Interior, along with the Gendarmerie General Command and the Coast Guard Command, to characterize migration inflows to Turkey. The authors conclude that Turkey has been a country of emigration to Western European countries (especially Germany) since the early 1960s but that starting in the 1980s, it became progressively a country of immigration. İçduygu and Yükseker (2012) document that until the Syrian refugee influx began in 2012, the primary form of migration to Turkey was more transit-related, irregular, and circular in nature. The authors define irregular migration as an umbrella concept that includes (i) transit migration, (ii) circular migration, and (iii) asylum seekers and refugees. The authors report that almost all irregular migrants who were apprehended before the beginning of the Syrian Civil War were from Iraq, Pakistan, Afghanistan, Iran, Bangladesh, Mauritania, and Somalia. Further, they document that the share of Syrian irregular migrants to Turkey before 2011 was negligible.

to be the geographic areas with similar ethnic communities. The official figures between 2012 and 2016 indicate that the six provinces within the old Aleppo *vilayet* received around half of the Syrian refugee population during the war, whereas they represented only 10% of Turkey's population in 2016. The cross-sectional variation in our instrument is consequently driven by the location of Arabic speakers in these six provinces and identifies an area in Turkey defined by pre-existing language and cultural links that did not receive a significant Syrian migration before 2012.

Recently, Jaeger et al. (2018) proposed a critique of shift-share instruments that exploit geographic variation in the concentration of immigrants to identify their impact on a variety of outcomes. According to the authors, if the composition of early migration settlement patterns shows correlations over time, with the same areas repeatedly receiving large inflows, then the short- and long-term responses to immigration will have contradictory responses that will confound their true effects. Our identification strategy is not subject to this critique, as the early settlements of Arabic speakers mainly originated from the Ottoman Empire rupture, a one-time historic event. Additionally, migration from Syria to Turkey was negligible before the onset of the Syrian conflict.

Table 2
Effects of refugees inflows on firm entry, exit, and international trade.

Dependent Variable (in logs)	Firm Entry	Firm Exit	Firms with Foreign Partnership	Exports	Imports
	(1)	(2)	(3)	(4)	(5)
Panel A. OLS					
PctRef: Share of Refugees (% Pop)	0.012*** (0.002)	−0.009 (0.006)	0.065*** (0.018)	0.028*** (0.007)	−0.004 (0.006)
Adj. R-squared	0.99	0.89	0.92	0.93	0.94
Panel B. Reduced Form					
Predicted Inflows: Syrian Displ. × Share Arabic_{1965}	0.016** (0.008)	−0.004 (0.023)	0.065 (0.040)	0.037 (0.034)	0.007 (0.017)
Adj. R-squared	0.99	0.89	0.91	0.93	0.94
Panel C. 2SLS					
PctRef: Share of Refugees (% Pop)	0.015** (0.009)	−0.004 (0.022)	0.063** (0.026)	0.037 (0.039)	0.007 (0.018)
Panel D. First Stage Dependent Variable	**PctRef: Share of Refugees (% Pop)**				
Predicted Inflows: Syrian Displ. × Share Arabic_{1965}	1.034*** (0.253)	1.034*** (0.253)	1.034*** (0.253)	0.995*** (0.246)	0.995*** (0.246)
First Stage F-statistic	16.71	16.71	16.71	16.37	16.37
Observations (for all panels)	567	567	567	1215	1215

Notes: Exports and imports are in nominal thousands of dollars. All panels include controls for province and year fixed effects. Standard errors clustered at the province level are shown in parentheses. There are 81 clusters in each regression. *Data Sources:* TOBB data was used for the first 3 columns; and province-level foreign trade data from TurkStat was employed in columns 4 and 5.

5. Results

5.1. Firm production and prices

5.1.1. Internal margin of production

We first analyze the effects of refugee arrivals on nominal sales and gross production, because through these estimates, we may be able to decompose the effects of refugee migration on output prices. Particularly, we decompose the overall impact on sales into two components: (i) change in gross production (estimated as sales plus change in inventories) and (ii) output prices. As sales are the product of gross production and prices, the following elasticity decomposition holds:

$$\varepsilon_{sales} = \varepsilon_{price} + \varepsilon_{production} \tag{7}$$

where ε shows the elasticities of sales, prices, and production, with respect to the inflow of refugees. Our main estimated equation is in a log-linear form (see equation (5)), thus it follows that (i) $\varepsilon_{sales} = \tau_{sales}$ x PctRef$_{pt}$, and (ii) $\varepsilon_{production} = \tau_{production}$ x PctRef$_{pt}$. Therefore, we can indirectly recover the impact of refugees on output prices by using the following equation:

$$\underbrace{\tau_{sales}}_{observable} = \tau Price + \underbrace{\tau\, Output}_{observable}$$

We present the estimates of equations (3) and (4) in Table 1 and illustrate the estimates of equation (6) in Fig. 6.[29] We find no evidence of a significant effect of refugee arrival on nominal sales and gross production or as a consequence on output prices. These results, however, do not account for under-reporting of nominal sales and gross production, which is a common practice in the Turkish economy due to high informal production (see Davutyan, 2008).

To circumvent any misreporting, we also estimate the effects of refugee arrival on energy consumption, as measured by electricity and oil expenditures. Energy consumption is an indirect measure of production that corrects for under-reporting, because the energy data available in the AISS surveys come from the energy consumption bills paid by the firm. Systematic under-reporting of these figures is unlikely, considering that the energy bills are based on a meter reading system. Using informality-corrected measures, we identify positive effects of refugee inflows on production through our instrumental variable and reduced-form estimates. In particular, we find that a one-percentage-point increase in the share of refugee population increases electricity and oil consumption by approximately 4.3% (see Table 1, columns 3 and 4). As shown in Fig. 6, gross production and sales of firms follow parallel trends across different provinces, in both pre- and post-refugee movement periods. The same trends also show a pattern change in energy demand by firms in the aftermath of major refugee movements.

5.1.2. External margin of production

We next explore the effects of refugee arrival on firm creation. Fig. 1 illustrates descriptive evidence of a dramatic increase in Syrian capital in Turkey after 2012. Panel B shows that between 2011 and 2016, the share of foreign firms with Syrian partnership increased by 35 percentage points, from 2% to 37%. The figure also shows that the total number of firms with foreign partnership also saw a drastic increase between 2013 and 2014, which was entirely driven by an increase in the number of firms with Syrian partnerships. The timing of this shock coincides with the year in which Turkey began receiving large inflows of refugees from Syria.

The ratio of Syrian to total foreign capital in Turkey shows a similar trend, increasing from 2% to 27% between 2011 and 2016, as observed in panel B. Finally, panel D also shows a sharp increase in the share of the capital among firms with Syrian partnership after the beginning of the

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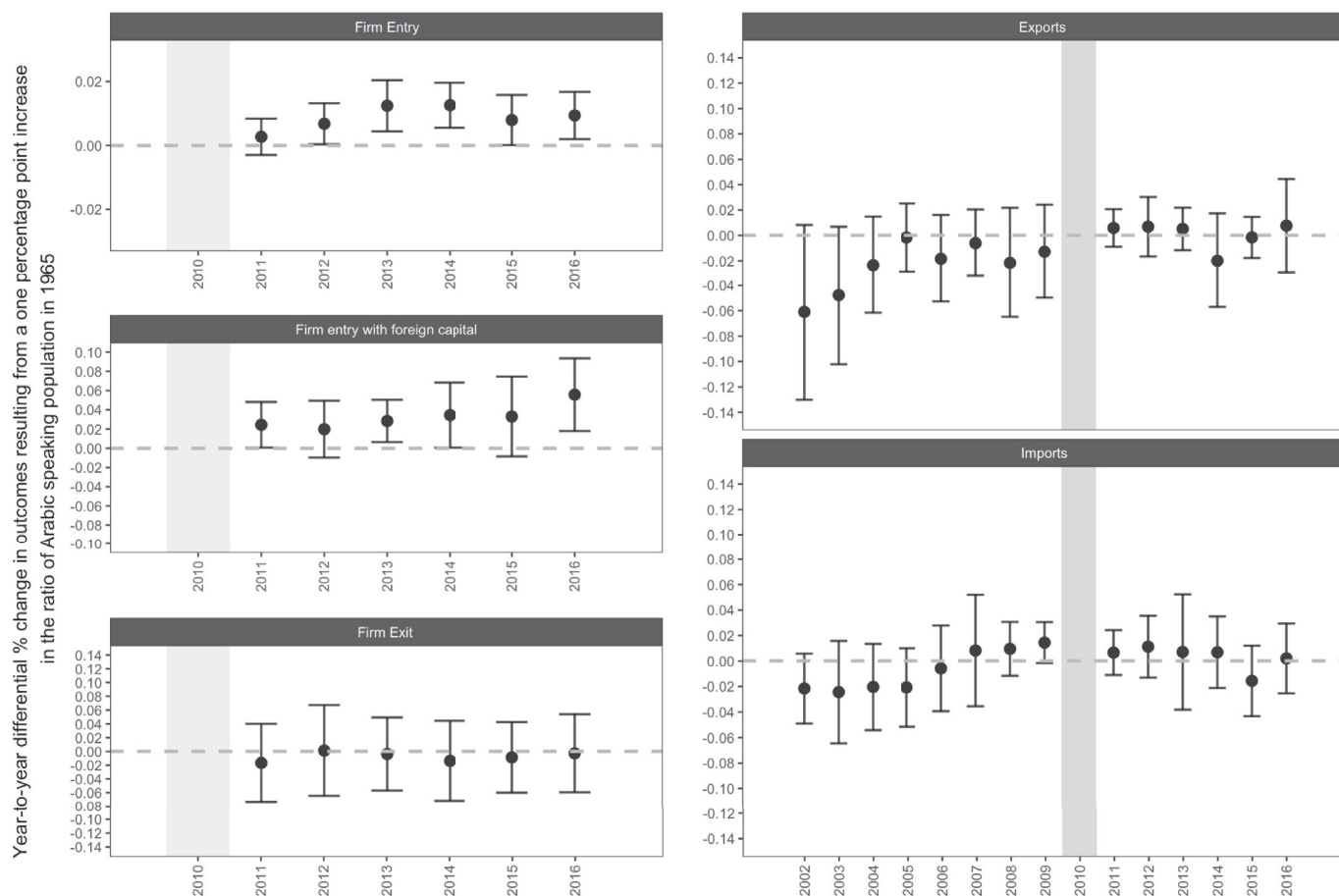[29] Bars around the point estimates indicate 95% confidence intervals.

Fig. 7. Difference-in-Differences Annual Estimates - TOBB data and province level foreign trade data.

Table 3
Effects of refugees inflows on input demands.

Dependent Variable (in logs)	Paid Employment	Total Employment	Wages	Capital
	(1)	(2)	(3)	(4)
Panel A. OLS				
PctRef: Share of Refugees (% Pop)	−0.003***	−0.003	−0.0002	−0.008***
	(0.001)	(0.002)	(0.001)	(0.003)
Adj. R-squared	0.01	0.01	0.19	0.03
Panel B. Reduced Form				
Predicted Inflows: Syrian Displ. × Share Arabic$_{1965}$	−0.001	0.001	0.002	−0.012**
	(0.003)	(0.004)	(0.002)	(0.005)
R-squared	0.01	0.01	0.19	0.03
Panel C. 2SLS				
PctRef: Share of Refugees (% Pop)	−0.001	0.001	0.001	−0.010**
	(0.002)	(0.004)	(0.001)	(0.004)
Panel D. First Stage Dependent Variable	PctRef: Share of Refugees (% Pop)			
Predicted Inflows: Syrian Displ. × Share Arabic$_{1965}$	1.248***	1.246***	1.248***	1.208***
	(0.169)	(0.174)	(0.169)	(0.110)
First Stage F-statistic	54.74	51.52	54.74	120.27
Observations (for all panels)	761,750	782,526	761,774	505,786

Notes: All panels include controls for province and year fixed effects. Standard errors clustered at the province level are shown in parentheses. There are 81 clusters in each regression. *Data source:* AISS.

Syrian conflict. Together, these figures pose strong descriptive evidence of a sharp arrival of Syrian entrepreneurship in Turkey as a consequence of the intensification of the Syrian Civil War.

To formally test for the effects of refugee inflows on firm entry, we use the firm censuses and create province-year cells, adding up the total number of firms with more than 20 employees. We then use our main specifications to estimate the effects of refugee inflows on the number of firms. Table 1 and Fig. 6 indicate a robust increase in the number of firms in refugee-hosting areas.

To test for the validity of these results, we also employ data on firm registration and liquidation, available between 2010 and 2016. These data include the number of all newly established firms of any size, newly established firms with foreign capital, and firms that exit the market, on a yearly basis. These data also cover all registered firms, independent of their size. The first three columns of Table 2 show the results of our main specifications using these data. The left panel of Fig. 7 shows the reduced-form event study coefficients. Our results in column 1 indicate that a one-percentage-point increase in the share of refugees as a percentage of population leads to a 1.5 percentage-point increase in the number of firms and a 6.3 percentage-point increase in the number of firms with foreign partnership. We do not find any evidence of significant effects of the refugee inflows on firm exit. The event study graphs confirm that the observed effects coincide with the period of substantial refugee inflow into Turkey.

To test whether the increment in the foreign number of firms in Turkey results in more trade, we also estimate our main regressions using the total Turkish exports and imports as outcomes. For this purpose, we employ foreign trade statistics from TurkStat for 2002 to 2017. Table 2 and Fig. 7 show the results. We do not identify a significant effect of refugee inflows on any of these outcomes.
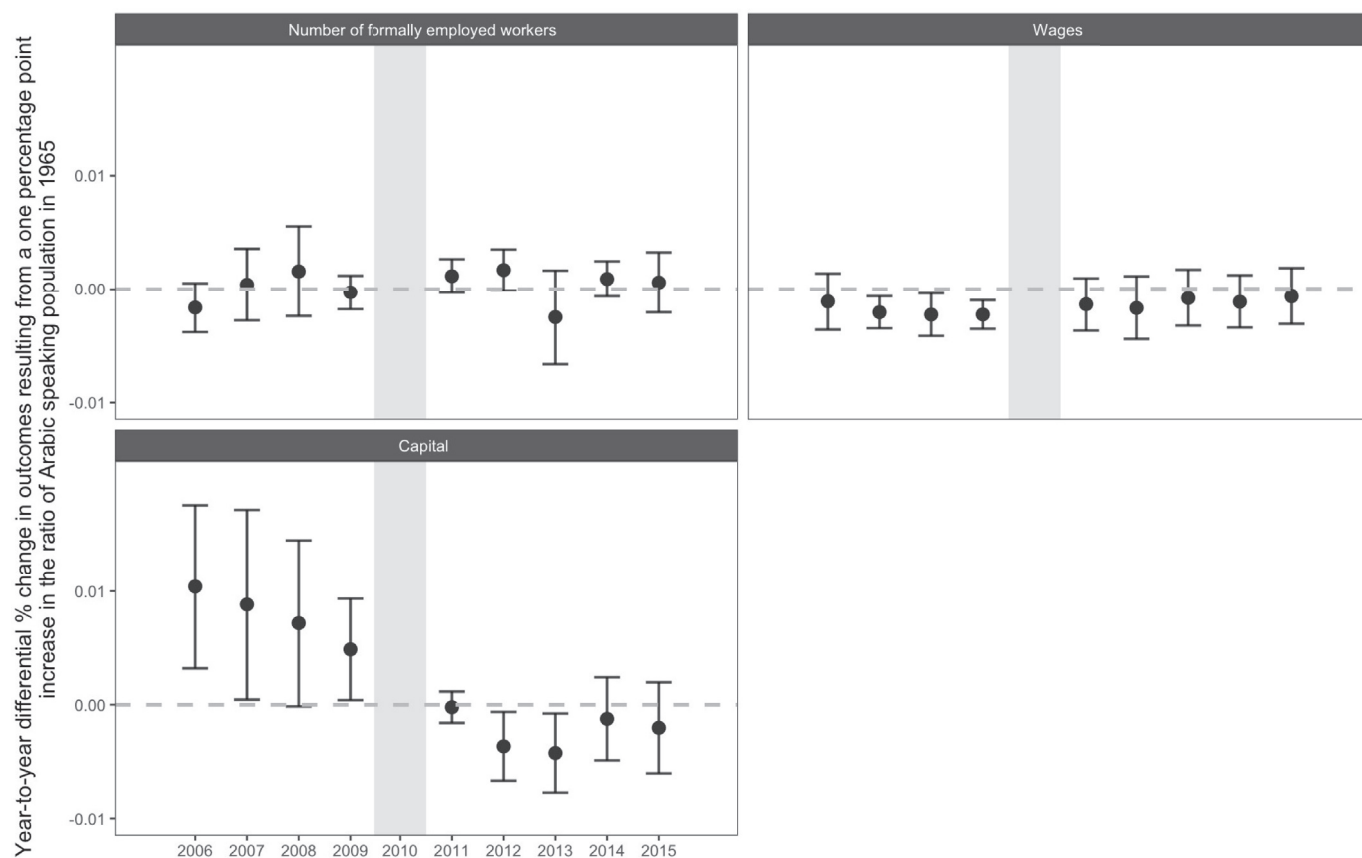
Fig. 8. Difference-in-Differences Annual Estimates, Input Demands - AISS data.

Table 4

Effects of refugees inflows by firm size.

Dependent Variable (in logs)	Sales		Employment		Wages	
Sample	Large	SMEs	Large	SMEs	Large	SMEs
	(1)	(2)	(3)	(4)	(5)	(6)
PctRef: Share of Refugees (% Pop)	−0.018	0.003	−0.002	−0.001	0.001	0.001
	(0.015)	(0.008)	(0.004)	(0.002)	(0.006)	(0.002)
First Stage F-statistic	33.38	52.18	33.38	55.62	33.38	55.62
Observations	36,825	745,628	36,825	724,922	36,825	724,946

Dependent Variable (in logs)	Electricity		Oil	
Sample	Large	SMEs	Large	SMEs
	(7)	(8)	(9)	(10)
PctRef: Share of Refugees (% Pop)	0.002	0.041**	−0.019	0.045***
	−0.03	−0.017	−0.024	−0.017
First Stage F-statistic	51.28	86.46	59.28	113.17
Observations	34,469	618,555	33,018	552,488

Notes: A firm is defined as Small or Medium size Enterprise (SME) if it has less than 250 employees. All panels include controls for province and year fixed effects. Standard errors clustered at the province level are shown in parentheses. There are 81 clusters in each regression. *Data Source:* AISS.

Overall, these results suggest a positive effect of refugee inflows on firms intensive and extensive margins of production, which are concentrated in the informal economy. Notably, we also document that the number of firms is increasing disproportionately in areas that host refugee populations and that part of these effects are driven by Syrian capital flows into refugee-hosting areas during the conflict period.

5.2. Impact of refugees on input demands

We next examine the effects of refugee inflows on labor and capital demands in Table 3 and Fig. 8. We find a negative and significant effect of refugee migration only on capital demand. These figures include only formal employment and as such, exclude any informally hired workers, who account for approximately one-third of the Turkish labor force and almost all refugee workers (as refugees do not have work permits in Turkey). Coefficients for the differential year-to-year trends for formal hiring and wages in both pre- and post-exposure periods fluctuate around zero, supporting the validity of our empirical strategy.

The negative estimates on firm capital in Table 3 (column 4) suggest that the refugee labor supply is a substitute for capital and that firms are

Table 5
Effects of refugees inflows by sector.

Sample	Manufacturing	Construction	Retail	Restaurants/Hotels	Others
	(1)	(2)	(3)	(4)	(5)
Dependent Variable (in logs)			Sales		
PctRef: Share of Refugees (% Pop)	−0.002	0.004	0.008	0.020	0.026*
	(0.009)	(0.020)	(0.009)	(0.016)	(0.015)
First Stage F-statistic	83.38	36.86	72.55	63.1	40.06
Observations	275,046	122,483	146,020	45,436	180,756
Dependent Variable (in logs)			Employment		
PctRef: Share of Refugees (% Pop)	0.002	0.001	−0.002	−0.001	0.000
	(0.005)	(0.002)	(0.002)	(0.005)	(0.005)
First Stage F-statistic	89.6	38.54	78.3	66.58	42.25
Observations	269,916	119,837	141,386	44,725	173,847
Dependent Variable (in logs)			Wages		
PctRef: Share of Refugees (% Pop)	−0.001	0.003***	0.005**	0.002	0.005*
	(0.002)	(0.001)	(0.002)	(0.002)	(0.003)
First Stage F-statistic	89.63	38.54	78.3	66.58	42.25
Observations	269,925	119,838	141,386	44,725	173,857
Dependent Variable (in logs)			Electricity		
PctRef: Share of Refugees (% Pop)	0.019	0.041**	0.027	0.053***	0.056***
	(0.013)	(0.016)	(0.023)	(0.016)	(0.019)
First Stage F-statistic	109.04	60.91	102.64	89.17	62.21
Observations	251,093	85,438	128,051	40,838	137,263
Dependent Variable (in logs)			Oil		
PctRef: Share of Refugees (% Pop)	0.025***	0.046**	0.033	0.037**	0.084***
	(0.005)	(0.020)	(0.021)	(0.017)	(0.020)
First Stage F-statistic	147.14	116.64	126.15	107.98	62.61
Observations	224,188	83,247	116,751	37,271	113,984

Notes: All panels include controls for province and year fixed effects. Standard errors clustered at the province level are shown in parentheses. There are 81 clusters in each regression. *Data Source:* AISS.

Table 6
Effects of refugees inflows on employment and wage. Sample: Men, 15-64.

Dependent Variable	*P* (employment)			*y**	*y**
Sample	All	Formal	Informal	Hours worked	Hourly Wage
	(1)	(2)	(3)	(4)	(5)
Panel A. OLS					
PctRef: Share of Refugees (% Pop)	−0.002**	0.002***	−0.004***	0.000	0.005***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Adj. R-squared	0.21	0.27	0.08	0.06	0.60
Panel B. 2SLS					
PctRef: Share of Refugees (% Pop)	−0.003***	0.000	−0.004***	0.004***	0.004**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Outcome mean	0.592	0.394	0.198	3.898	1.482
Panel C. First Stage **Dependent Variable**	**PctRef: Share of Refugees (% Pop)**				
Predicted Inflows: Syrian Displ. × Share Arabic 1965	1.233***			1.295***	1.219***
	(0.238)			(0.233)	(0.234)
First Stage F-statistic	46.422			53.604	50.780
Observations (for all panels)	1,911,501			1,282,723	780,165

Notes: *: hours worked and wages only include workers with a positive hours worked and wage. The coefficients are log transformation on the dependent variable. The HLFS only interviews Turkish nationals. The regressions use data from the Turkish labor force annual surveys from 2005 to 2016. The estimates are by individual and include controls for province, year, age, education, and marital status. Standard error reported in parentheses were clustered at the region-year level. *Data Source:* HLFS.

modifying their production technology. These results, however, are weakly supported by the event-study analysis presented in Fig. 8. Although the figure shows a differential positive trend in capital in favor of provinces with a higher share of Arabic-speaking populations, we still observe a drastic change in trends after the conflict onset in 2012.

5.3. Heterogeneous effects by firm type

Table 4 and Table 5 show the estimated two-stage least squares

results by firm size and sector.[30] Specifically, we split our sample by (i) firm size, between small- and medium-size firms (SMEs) with 250 or fewer employees and their larger peers and (ii) industry, between the firms that operate in the manufacturing, construction, retail, restaurant, hotel, and other sectors that do not fit into any of these categories, as

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[30] The other specifications and variables are available upon request. We do not report them here due to space concerns.

defined by TurkStat.

The subsample-specific results are similar to the effects observed for the whole-sample estimates. We find no evidence of significant effects of refugee inflows on sales, formal employment, or wages (except in construction and retail, which is in line with the demand shock experienced in these sectors), but we identify significant positive effects on electricity and oil consumption. We also observe that the positive effects of refugee inflows on energy consumption are entirely driven by SMEs, which is consistent with previous evidence suggesting that small firms are more sensitive to economic shocks (Narjoko and Hill, 2007; Vannoorenberghe, 2012; Kurz and Senses, 2016) and with the idea that the effects of refugee inflows are concentrated in the informal sector, where most small firms operate.

The sector-based estimates show similar results for sales and formal employment in addition to positive and statistically significant effects for formal wages paid by firms. The positive effects observed for energy consumption are driven by firms in the construction, restaurant, hotel, and "other" sectors. Informal work is traditionally more common and easier in construction and hospitality sectors, which may facilitate higher production. Additionally, we speculate that these sectors might enjoy a larger aggregate demand shock due to refugee migration, as housing and food are necessity goods. The results observed in the construction sector also may be driven by the fact that Syrian refugees are not allowed to buy real estate in Turkey. Thus, some of them may create firms through which to buy real estate.

6. Refugee inflows and the informal economy

6.1. Labor supply of native workers

The reported effects of refugee inflows into labor markets exclude informally hired workers, which we attempt to incorporate into our study using the annual Turkish Household Labor Force Surveys from 2005 to 2016. These surveys include individual information from Turkish citizens aged 15–64 years.

Using these data, we estimate equations (4) and (5), after aggregating the endogenous variable and the instrument at the 26 Nomenclature of Territorial Units for Statistics-2 regions.[31] We examine particularly the impacts of refugees on formal and informal employment, hours worked, and wages.[32] All regressions include controls for age and fixed-effects for education level and marital status. The standard errors are clustered at the region-year level (338 clusters).

Table 6 and Fig. 9 present the results for men, who constitute 75% of the Turkish labor force population in our sample. The two-stage least squares results suggest that an increment of 1 percentage point in the inflow of refugees to total population results in a large decline in informal employment (0.4 percentage points), but we find no detectable impact on the likelihood of being formally employed. Overall, the total employment rate drops by 0.3 percentage points among native male workers. Del Carpio and Wagner (2015), Ceritoglu et al. (2017), and Aksu et al. (2018) show similar displacement patterns for men in the informal sector. For those who remain employed, a one-percentage point-increase in the share of refugee to total population increases total hours worked and wages by 0.4%. We speculate that the increased wages and hours worked

for the native men who remain employed indicate that refugees are more likely to replace native workers in low-tier jobs. Positive effects of migrants flows on wages have also been document in other contexts by Card (2005), Ottaviano and Peri (2012), and Foged and Peri (2016).[33]

Fig. 9 illustrates that the outcomes of interest show strikingly similar trends across provinces from 2005 to 2011, supporting the validity of our empirical strategy.[34] The estimates confirm a negative impact of refugee inflows on total male employment, mainly driven by a decline in informal employment. Estimated year-to-year reduced-form estimates again peak with the intensity of the refugee shock. We also observe similarly stable patterns until the beginning of the refugee shock and subsequent increases in total hours worked and average wages for native workers who remain employed.

The two-stage least squares results for native women show a reduction in employment. Yet, contrary to men, women experience a decline only in formal employment (see Table 7 and Fig. 10). As we show in Fig. 10, pre-existing trends in female labor supply might confound the causal interpretation of the estimates for women.[35]

Overall, our results strongly support the idea that refugees are largely displacing male native workers in the informal labor market, which in turn is reflected in a reduction of overall employment of native workers.

6.2. Supporting qualitative evidence

In this section, we briefly document qualitative evidence from in-depth interviews and focus groups with 22 employers in the textile, apparel, and service sectors, two business associations, and 1,003 Syrian refugee workers aged between 18 and 29 and located in Turkey during 2017. The surveys aimed at enhancing knowledge on the employment needs, challenges, and opportunities of young Syrian refugees in Turkey (IYF, 2018). In this subsection, we focus our analysis on understanding businesses motives for hiring young refugees informally.

The most striking finding from the study was that only 4% of all Syrian refugee respondents had applied for a work permit to be hired formally at the time of their respective interviews. Yet, almost 90% of the interviewees were already working informally in Turkey. Additionally, the interviews suggest that a primary motive for business owners to informally hire Syrian refugees is their low cost of labor and strong attachment to low-paid jobs, relative to their Turkish peers. In particular, the interviews indicate that young Syrians work for lower wages and longer hours.[36] Business owners also report that government restrictions play an important role in creating incentives to hire refugees informally. The bureaucratic process for legally hiring Syrian refugees is reported to

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[31] Nomenclature of Territorial Units for Statistics-2 is the smallest geographic level for which data are representative.

[32] We define employment as being a regular, paid employee or self-employed and exclude being an employer or an unpaid family worker. This definition of employment is similar to the one used by Del Carpio and Wagner (2015) in their analysis of the impacts of refugees in labor markets. The only difference is that they exclude the public sector, but we do not. We define informal employment as being employed but not contributing to social security. This definition is the most commonly used by Turkstat to define the size of informal employment in Turkey (for a definition of informal economy in general, please see also Footnote 2).

[33] Currently, there is an academic debate on the sign of the effects of migration on wages in host economies. See Borjas (2003) and Dustmann et al. (2017) for details.

[34] Formally, at any conventional significance level, we cannot reject the null hypothesis that the pre-exposure interaction coefficients in equation (6) are jointly equal to zero. The *p*-value of the joint *F*-test in the pre-exposure period on year and Arabic population in 1965 interaction coefficients are 0.21, 0.20, 0.37, 0.53, and 0.14 for employment, formal employment, informal employment, hours worked, and hourly wage, respectively.

[35] Formally, we reject the null hypothesis that the pre-exposure interaction coefficients in equation 6 are jointly equal to zero in the case of native women, both for overall and formal employment, while for informal employment we cannot.

[36] As previously noted, the average wage of a young Syrian in Istanbul is 1492 Turkish Liras, compared with 1883 Turkish Liras for young native workers. In addition, approximately 90% of young Syrian workers report working more than 48 h a week. Similar qualitative evidence has been documented by several media outlets (see for example, Reuters, 2015; Al Monitor, 2016; ABC News, 2014; and Financial Times, 2017).
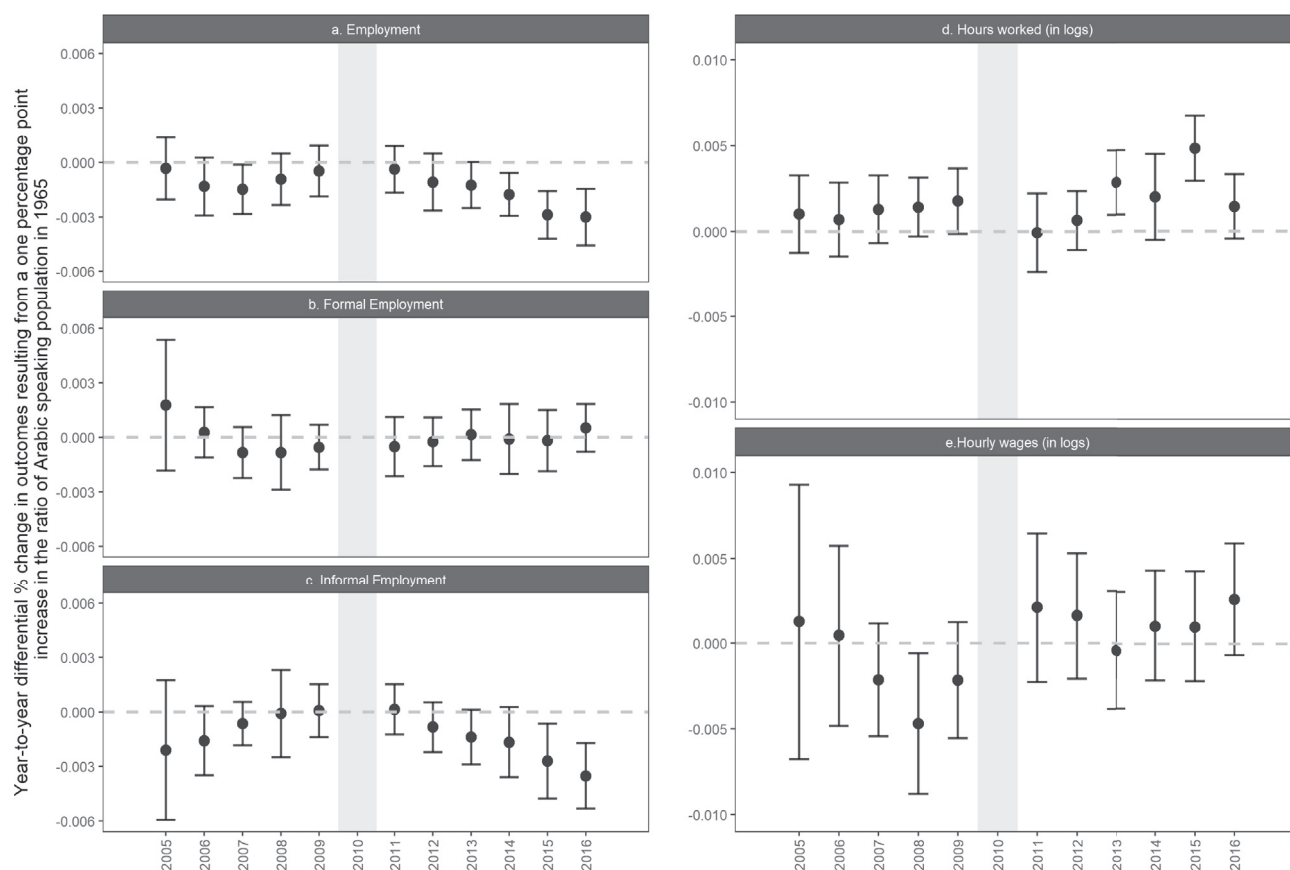
Notes: The HLFS only interviews Turkish nationals. The regressions use data from the Turkish labor force annual surveys from 2005 to 2016. The estimates are by individual and include controls for year, province, age, education, and marital status. Standard error reported in parentheses were clustered at the region-year level.

Fig. 9. Difference-in-Differences Annual Estimates - HLFS, Sample: Men, 15–64.

Table 7
The effects of refugees inflows on employment and wage, sample: Women, 15-64.

Dependent Variable	*P*	(employment)		*y**	*y**
Sample	All	Formal	Informal	Hours worked	Hourly Wage
	(1)	(2)	(3)	(4)	(5)
Panel A. OLS					
PctRef: Share of Refugees (% Pop)	−0.001	−0.001***	0.001	0.001	0.003
	(0.001)	(0.000)	(0.001)	(0.003)	(0.002)
Adj. R-squared	0.18	0.27	0.02	0.12	0.63
Panel B. 2SLS					
PctRef: Share of Refugees (% Pop)	−0.003***	−0.003***	0.001	0.011***	−0.003
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)
Outcome mean	0.165	0.103	0.062	3.617	1.527
Panel C. First Stage **Dependent Variable**	**PctRef: Share of Refugees (% Pop)**				
Predicted Inflows: Syrian Displ. × Share Arabic 1965	1.233***			1.516***	1.362***
	(0.236)			(0.209)	(0.229)
First Stage F-statistic	46.192			127.994	84.029
Observations (for all panels)	2,032,722			532,633	257,008

Notes: *: hours worked and wages only include workers with a positive hours worked and wage. The coefficients are log transformation on the dependent variable. The HLFS only interviews Turkish nationals. The regressions use data from the Turkish labor force annual surveys from 2005 to 2016. The estimates are by individual and include controls for province, year, age, education, and marital status. Standard error reported in parentheses were clustered at the region-year level. *Data Source:* HLFS.
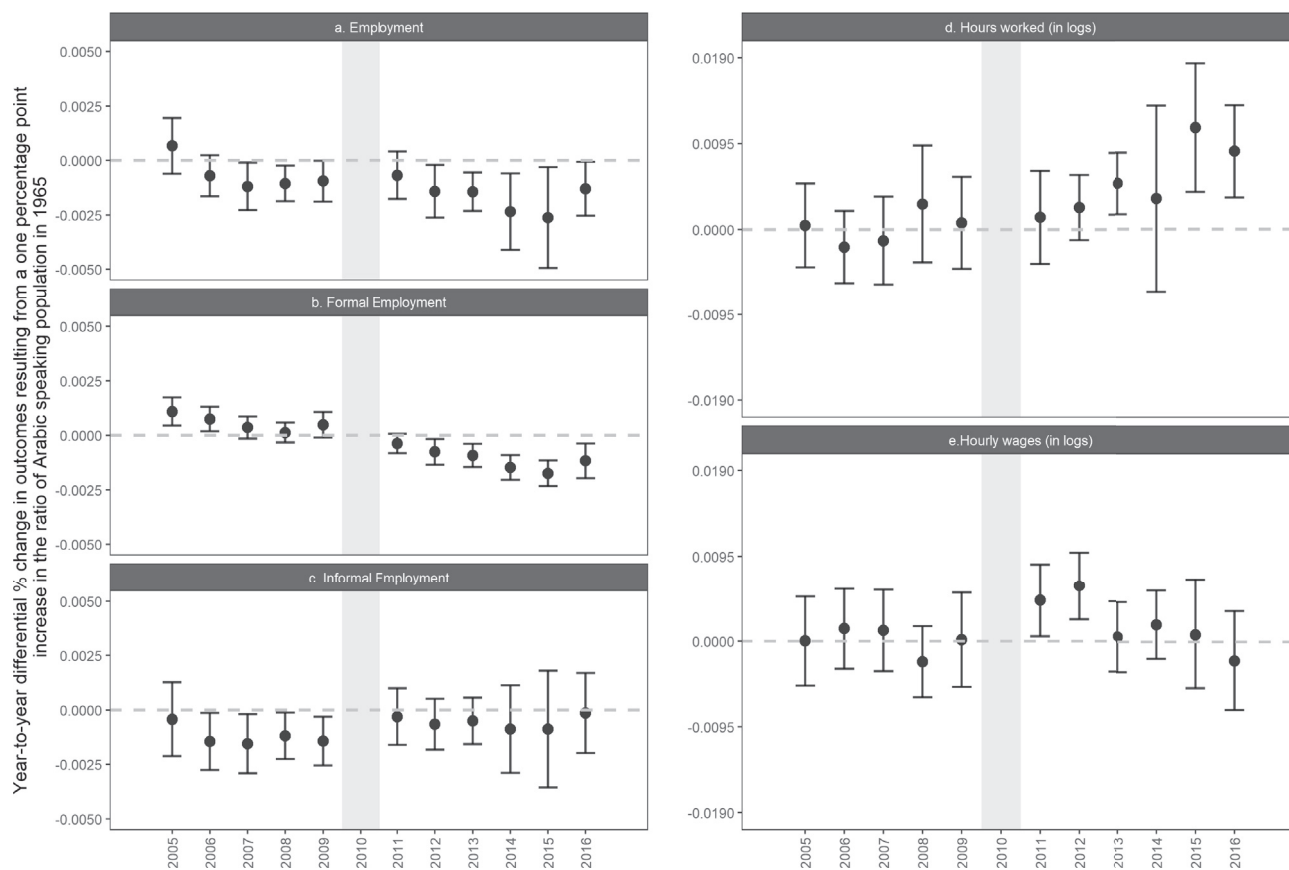
Notes: The HLFS only interviews Turkish nationals. The regressions use data from the Turkish labor force annual surveys from 2005 to 2016. The estimates are by individual and include controls for year, province, age, education, and marital status. Standard error reported in parentheses were clustered at the region-year level.

Fig. 10. Difference-in-differences annual estimates - HLFS, sample: Women, 15-64.

be time consuming, costly, and complicated.[37] The surveys also suggest that Syrian employment is limited by the difficulty around official recognition of skills, education, and occupational qualifications. Particularly, language is cited as a critical barrier to higher-wage jobs. Finally, the survey results suggest that some refugees are not interested in formal work. Business owners report that whereas Turkish workers demand to be insured, Syrian refugees just want to be paid the insurance premium in cash, as they face uncertainty about whether they will stay in Turkey as permanent residents and receive a pension.

7. Robustness tests

To test the robustness of our empirical analysis, we conduct several exercises. We begin by imposing three sample restrictions. First, we exclude Istanbul from the main estimates, because a large share of economic activity occurs in this province and because refugees have settled in large numbers there.

Second, we restrict our sample to single-plant firms. As explained in the data section, the AISS surveys uses the headquarters location for each firm. We impute that location for all plants of the firm, which might not be the case for many of them. Thus, we re-estimate all our regressions, restricting the sample to include only single-plant firms for which we have no measurement error. The results are robust to both of these individual sample restrictions and their combined restrictions.[38]

Third, we re-estimate our regressions, excluding the border provinces. These provinces might be negatively affected by the Syrian conflict, regardless of the refugee inflows. Assuming the impact of the civil war in Syria on nearby provinces is negative, the Wald estimator in the instrumental variable specification would be biased negatively, suggesting that our reported outcomes represent lower-bound estimates for the true effects of refugee inflows. To account for this potential issue, we re-estimate our regressions excluding the border provinces. Although the residual variation is not sufficiently strong to be a reliable instrument, we still observe similar results for the reduced-form, difference-in-differences estimates, suggesting that the main estimates are robust to even muting a substantial part of the variation in our instrument.[39]

In a separate exercise, to further test the validity of our empirical strategy, we modify our instrument to directly represent the concentration of Arabic speakers in 1965 according to the following formula:

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[37] For example, the Ministry of Labor and Social Security in Turkey dictates that the number of Syrian refugees legally employed in a firm cannot exceed 10% of the total number of Turkish employees. Moreover, the work permit costs 600 Turkish Liras per year per Syrian worker and must be renewed annually.

[38] The results are available upon request but not included in the main manuscript due to space concerns.

[39] The results are omitted due to space constraints and available upon request.

$$\text{Predicted Inflows}^{\text{robust}}_{\text{pt}} = \left[\frac{\text{Arabic Speaking Pop}_{\text{p,1965}}}{\text{Total Arabic Speaking Population}_{\text{p,1965}}} \times \text{Syrian Aggregate Displacement}_t \right]$$

where Predicted Inflows$^{\text{robust}}_{\text{pt}}$ is the interaction of the concentration of Turkish citizens with an Arabic mother language in 1965 and the total number of individuals displaced outside Syria in year *t*. The modified instrument places more weight in provinces around the Turkish-Syrian border. When we re-estimate our main specifications using the modified instrument, we obtain similar results.[40]

Finally, we estimate our main specifications by dividing our sample according to labor intensity. The goal of this exercise is to test whether labor-intensive and capital-intensive firms face different competitive environments after the arrival of refugees. To this end, we calculate the ratio of labor expenditures (defined as salaries plus social security contributions) over gross output and separately estimate our main specifications for firms that are below- and above-median labor intensity of production. As shown in Appendix IV, we find similar marginal effects for samples stratified by labor intensity. These results support our original hypothesis.

8. Concluding remarks

This study examines the impact of a large refugee shock on firm behavior. We do not identify significant effects on firms' formal production figures (measured by reported sales and gross output for accounting purposes), but we find strong evidence of a positive effect of refugee inflows on production proxies that account for firms under-reporting, such as oil and electricity consumption. Similarly, we find that refugee migration boosts firm creation, especially the share of those with a foreign partnership. However, most of this growth occurs in the informal economy and leads to a net displacement of native workers.

Several potential mechanisms explain these findings. The likelihood of permanently leaving their original location might have induced the Syrian civil war refugees to bring most of their accumulated wealth to the host country and invest it. Our analysis supports the idea that Syrian entrepreneurship and capital increased dramatically in hosting areas. Additionally, fixed costs associated with initial resettlement, such as housing and establishing new businesses, might contribute to the positive shock, especially in the construction sector. Anecdotal evidence suggests that the construction sector is expanding[41] and that refugees are more likely to work in this industry through subcontracting (Erdoğan and Unver, 2015). The inflow of aid provided to refugee settlement locations by the Turkish government, international governments, and other non-governmental organizations are supplied mainly by local firms, which also might contribute to the observed changes in firm outputs (Erdoğan and Unver, 2015).

Overall, our findings support all of these hypotheses, given that the empirical analysis suggests that small SMEs and the construction and hospitality sectors are the main drivers of the positive effects of refugee inflows in hosting economies. Reduced labor costs through informal hiring of refugees also contribute to the local production boom in refugee-hosting areas. Both firm and labor supply data show no change in formal hiring, but we observe a significant replacement of refugee workers with their Turkish peers in the informal economy. Similar decreases in extensive and intensive margins of labor supply by native workers are shown in Del Carpio and Wagner (2015), Ceritoglu et al. (2017), and Aksu et al. (2018). In contrast to these studies, we do not observe robust changes in the formal labor supply. These results are consistent with the hypothesis that formal firms may hire Syrian refugees without reporting it.

Although we use rich data and explore all data sources related to business in Turkey, there are relevant questions that we cannot address due to data restrictions. First, there are no data to fully characterize the impacts that refugee inflows have on the informal sector, such as data on refugees' labor supply. Future research should explore new data sources or measurement methodologies to shed light on the impacts of refugee shocks in the informal economy.

Second, future research should examine the net impact of refugee inflows on overall production in hosting countries. To motivate future discussions in this direction, we present a theoretical model in Appendix V. The model illustrates the effects of a refugee shock in a hosting economy composed of workers and firms and divided into formal and informal sectors. Given our theoretical setup, we show that the net impacts of refugee migration on overall production inside a hosting economy will depend on the size and direction of overall wage and price changes. Although in Turkey, there is no readily available data to identify these parameters, identifying these effects as new data become available is certainly merited.

Declaration of competing interest

The authors declare that they have no relevant or material financial interests that relate to the research described in this paper.

Appendix I. Characteristics of Syrian refugees in Turkey

Demographic Characteristics of Syrian Refugees in Turkey, January 2017

I. Gender (%)	
Male	53.2
II. Age (%)	
0–4	13.7

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[40] The results are omitted due to space constraints and available upon request.
[41] See Al Monitor, 2016; Hurriyet Daily News, 2016 for examples of media reports.

(*continued*)	
5–11	16.2
12–17	14.8
Minors (18<)	**44.7**
18–59	51.9
60+	3.3
III. Education (%) *	
Illiterate (includes young children)	32.0
No degree (literate)	12.5
Primary	15.8
Secondary	9.9
Some College +	2.0
Unknown	27.8
Total number of refugees:	**3,168,757**

Notes: * Education data are only available for registered 2.5 million refugees as of April 2016. The information on gender and age comes from the UN Refugees Office as of January of 2017.
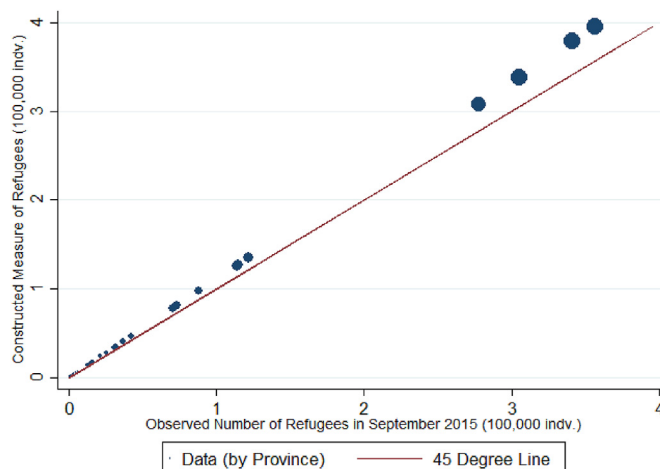
Appendix II. Firm outcomes time trends

Annual trends on firms outcomes (Nominal Values in Logs) - AISS data
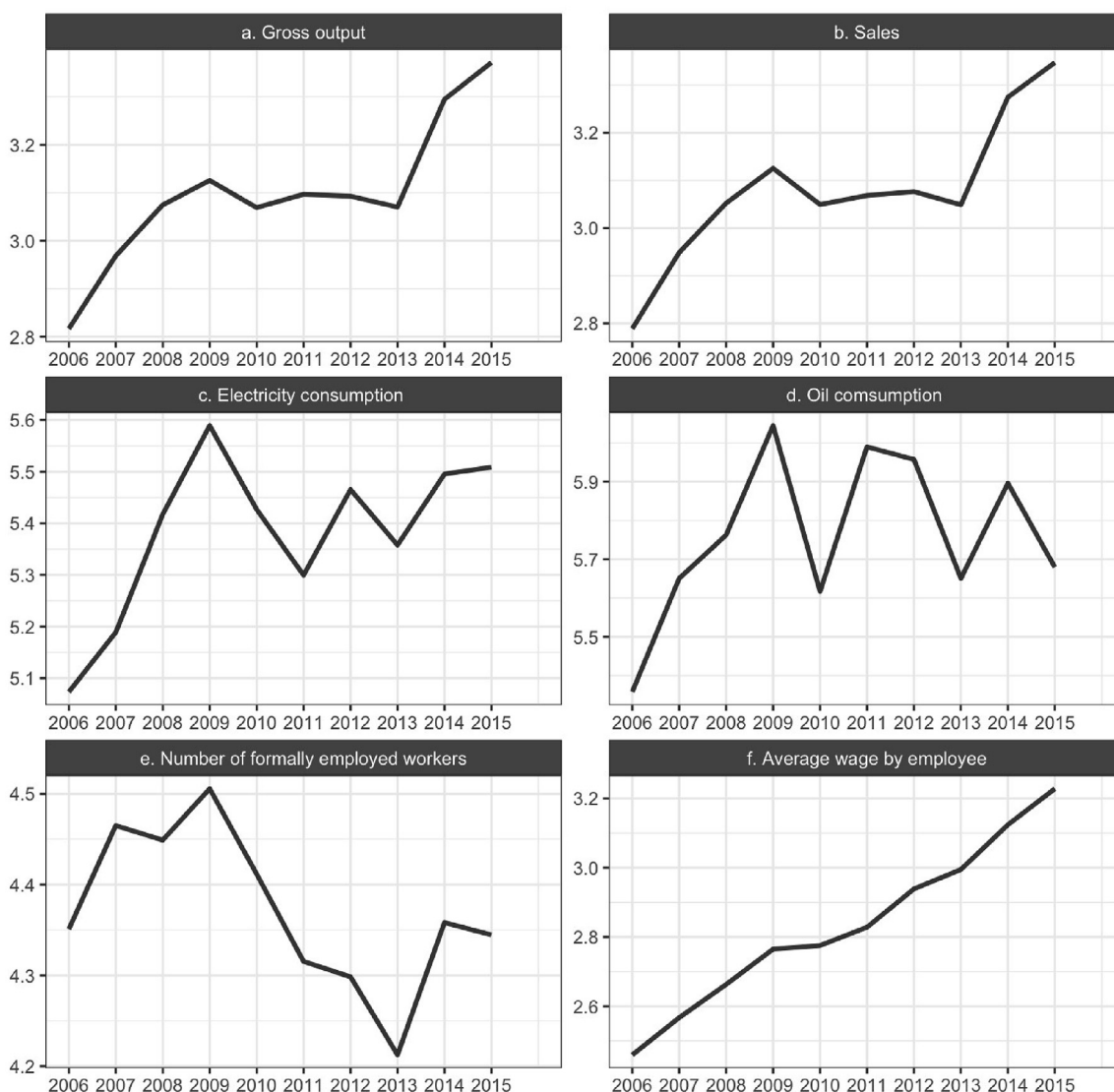
Appendix III. Quality of constructed measure of inflows of refugees

Constructed vs. Observed Measure of Province-Level Inflows of Refugees

Appendix IV. Effects of refugee shock by labor intensity

Dependent Variable (in logs)	Electricity		Oil	
	Low	High	Low	High
	(1)	(2)	(3)	(4)
Panel A. OLS				
PctRef: Share of Refugees (% Pop)	0.004	0.015*	0.013	0.017**
	(0.011)	(0.008)	(0.008)	(0.007)
Adjusted R-squared	0.036	0.042	0.017	0.017
Panel B. Reduced Form				
Predicted Inflows: Syrian Displ. Share Arabic1965	0.004***	0.004**	0.004***	0.004***
	(0.001)	(0.002)	(0.001)	(0.001)
Adjusted R-squared	0.04	0.04	0.02	0.02
Panel C. 2SLS				
PctRef: Share of Refugees (% Pop)	0.035***	0.033***	0.034***	0.033***
	(0.008)	(0.012)	(0.009)	(0.004)
Panel D. First Stage **Dependent Variable**				
Predicted Inflows: Syrian Displ. Share Arabic1965	0.123***	0.131***	0.126***	0.131***
	(0.012)	(0.018)	(0.012)	(0.017)
First Stage F-statistic	100.34	52.09	102.47	59.07
Observations (for all panels)	287,996	264,048	264,412	238,501

Notes: We estimate the ratio of total wages over total production and split the sample according to the median value for the period of analysis.

Appendix V. The Model

In this appendix we propose a theoretical framework to illustrate the effects that higher inflows of refugee migration can have on the overall production of a reception economy that is divided into a formal and an informal sector.

V.1 General Framework

Consider a local economy composed of workers and firms and divided into a formal and informal sector. The informal sector is composed by those workers and firms that carry out their economic activities without registering them with local authorities or paying taxes. Formal firms can hire workers formally or informally. This attempts to capture the possibility that formal firms may hire some workers informally to reduce their tax burden.

Each sector is composed of one representative firm, which could be also understood as the aggregation of smaller competitive homogeneous firms. Firms in each sector only use labor to produce their output. The goods produced by each firm in the formal and informal sector are independent.

Workers in this economy can be refugees (r) or natives (n). They can also be of high (h) or low (l) skill. Considering that refugees arrive to new locations without legal identification documents, with low experience in jobs that have high local demand, and that they generally do not speak the local language, we assume they are low-skilled workers. Native workers can be either of low or high skill.

The economy is endowed with a total of $\bar{L}_r$, $\bar{L}_{n,h}$ and $\bar{L}_{n,l}$ workers of each type, where each worker has one unit of time. Informal firms only hire low-skilled workers.

V.2 Informal Production

The representative firm in the informal sector chooses the amount of low-skilled labor (from refugees and natives) to maximize its profits given wages (w_{ir}, w_{in}), prices (p_i), and a production technology (Qi). Specifically, the problem faced by the firm can be expressed as

$$\max_{L_r, \, L_{nl} \geq 0} p_i Q_i - w_{in}[\gamma L_r + L_{nl}], \; with \; Q_i = \phi[LnL_r + LnL_{nl}] \tag{9}$$

where ϕ represents a productivity parameter such that $\phi > 0$, γ is a penalty paid by refugee workers such that $\gamma < 1$ and $w_{ir} = \gamma w_{in}$.

The solution to this problem yields the following labor demands and product supply:

$$L_i^{r^{*D}} = \frac{p_i \phi}{w_{ir}} \tag{10}$$

$$L_i^{nl^{*D}} = \frac{p_i \phi}{w_{in}} \tag{11}$$

$$Q_i^{*S} = \phi Ln\left[\frac{p_i \phi}{w_{ir}}\right] + \phi Ln\left[\frac{p_i \phi}{w_{in}}\right] \tag{12}$$

V.3 Formal Production

The representative formal firm chooses labor from refugees, high-skill, and low-sill natives and solves the following problem

$$\max_{L_r, \, L_{nl}, \, L_{nh} \geq 0} p_f Q_f - w_{in}[\gamma L_r + L_{nl}] - \left[w_f + T\right]L_{nh}, \; with \; Q_f = \psi_1[LnL_r + LnL_{nl}] + \psi_2[LnL_{nh}] \tag{13}$$

where $0 < \psi_1 < \psi_2$, and T represents the costs of the taxes and regulations paid to the government for formal workers. We assume that the government uses the tax collection to provide a non-rival and non-excludable good (which could be understood as a lump sum transfer, and hence, leaves the firms' problem unchanged).

The solution to this maximization problem yields the formal labor demands and output supply, which can be expressed as

$$L_f^{r^{*D}} = \frac{p_f \psi_1}{w_{ir}} \tag{14}$$

$$L_f^{nl^{*D}} = \frac{p_f \psi_1}{w_{in}} \tag{15}$$

$$L_f^{nh^{*D}} = \frac{p_f \psi_2}{\left[w_f + T\right]} \tag{16}$$

$$Q_f^{*S} = \psi_1 Ln\left[\frac{p_f \psi_1}{w_{ir}}\right] + \psi_1 Ln\left[\frac{p_f \psi_1}{w_{in}}\right] + \psi_2 Ln\frac{p_f \psi_2}{(w_f + T)} \tag{17}$$

V.4 Worker's Supply

We assume that all worker's supply is inelastic such that

$$[L_r]^{*s} = \overline{L}_r \tag{18}$$

$$[L_{ln}]^{*s} = \overline{L}_{ln} \tag{19}$$

$$[L_{hn}]^{*s} = \overline{L}_{hn} \tag{20}$$

V.5 Worker's Demand for Production

Refugees and natives choose their consumption of the informal and formal product to maximize their utility. The maximization process for each individual could be written as

$$\max_{Q_i, \, Q_f \geq 0} U\left(Q_i, \, Q_f\right) s.t. \; p_i Q_i + p_f Q_f = I \tag{21}$$

where I represents total income (equivalent to $w_{ir}\overline{L}_r$ for refugees, $w_{in}\overline{L}_{ln}$ for natives with low-skill, and $w_f\overline{L}_{hn}$ for natives with high-skill). The production function for each individual is represented by a Cobb Douglas functional form with preference parameters κ, λ, and μ for refugees, low-skill natives, and high-skill natives, respectively. All the preference parameters have a positive value less than one. Consequently, the total demand for each type of good could be written as

$$Q_i^{*D} = \frac{\kappa w_{ir}\overline{L}_r}{p_i} + \frac{\lambda w_{ln}\overline{L}_{ln}}{p_i} + \frac{\mu w_f\overline{L}_{hn}}{p_i} \tag{22}$$

$$Q_i^{*D} = \frac{(1-\kappa)w_{ir}\overline{L}_r}{p_f} + \frac{(1-\lambda)w_{ln}\overline{L}_{ln}}{p_f} + \frac{(1-\mu)w_f\overline{L}_{hn}}{p_f} \tag{23}$$

V.6 Equilibrium

The equilibrium in this economy is given by a vector of prices and wages $(p_i, p_f, w_{in}, w_{ir}, w_f)$ such that:

$$Q_i^{*S} = [Q_i]^{*D} \tag{24}$$

$$Q_f^{*S} = [Q_f]^{*D} \tag{25}$$

$$[L^r]^{*S} = L_f^{r*D} + L_i^{r*D} \tag{26}$$

$$[L^{nl}]^{*S} = L_f^{nl*D} + L_i^{nl*D} \tag{27}$$

$$[L^{hl}]^{*S} = L_f^{hl*D} \tag{28}$$

V.7 Impacts of a Positive Shock of Refugees on Formal Production

From the equilibrium, all quantities produced and employment hired in the equilibrium are a function of the vector of prices $(p_i, p_f, w_{ir}, w_{in}, w_f)$. Hence, using equations (12) and (17) we have that

$$\frac{dQ_f}{d\overline{L}_r} = \frac{\partial Q_f}{\partial p_f}\frac{dp_f}{d\overline{L}_r} + \frac{\partial Q_f}{\partial p_i}\frac{dp_i}{d\overline{L}_r} + \frac{\partial Q_f}{\partial w_f}\frac{dw_f}{d\overline{L}_r} + \frac{\partial Q_f}{\partial w_{in}}\frac{dw_{in}}{d\overline{L}_r} + \frac{\partial Q_f}{\partial w_{ir}}\frac{dw_{ir}}{d\overline{L}_r} \tag{29}$$

Considering that the formal and informal products are independent goods:

$$\frac{\partial Q_f}{\partial p_i} = 0 \tag{30}$$

Moreover, given the assumptions of the model:

$$\frac{\partial Q_f}{\partial p_f} > 0, \ \frac{\partial Q_f}{\partial w_f} < 0, \frac{\partial Q_f}{\partial w_{in}} < 0, \frac{\partial Q_f}{\partial w_{ir}} < 0 \tag{31}$$

Hence, we can derive the following conclusion concerning the impacts of a refugee shock on formal production:
Lemma 1

If $\frac{dp_f}{d\overline{L}_r} \geq 0$, $\frac{dw_{in}}{d\overline{L}_r} \leq 0, \frac{dw_{ir}}{d\overline{L}_r} \leq 0$ and $\frac{dw_f}{d\overline{L}_r} \leq 0$ it will be true that $\frac{dQ_f^S}{d\overline{L}_r} > 0$.

9.8 Impacts of a Positive Shock of Refugees on Informal Production

Using a parallel analysis and equations (12) and (17) we have that

$$\frac{dQ_i}{d\overline{L}_r} = \frac{\partial Q_i}{\partial p_f}\frac{dp_f}{d\overline{L}_r} + \frac{\partial Q_i}{\partial p_i}\frac{dp_i}{d\overline{L}_r} + \frac{\partial Q_i}{\partial w_f}\frac{dw_f}{d\overline{L}_r} + \frac{\partial Q_i}{\partial w_{in}}\frac{dw_{in}}{d\overline{L}_r} + \frac{\partial Q_i}{\partial w_{ir}}\frac{dw_{ir}}{d\overline{L}_r} \tag{32}$$

Considering that the formal and informal products are independent goods:

$$\frac{\partial Q_i}{\partial p_f} = 0 \tag{33}$$

Moreover, given the assumptions of the model:

$$\frac{\partial Q_i}{\partial p_i} > 0, \ \frac{\partial Q_i}{\partial w_f} < 0, \frac{\partial Q_i}{\partial w_{in}} < 0, \frac{\partial Q_i}{\partial w_{ir}} < 0 \tag{34}$$

Hence, we can derive the following conclusion concerning the impacts of a refugee shock on informal production:

Lemma 2

If $\frac{dp_i}{dL_r} \geq 0$, $\frac{dw_{in}}{dL_r} \leq 0$, $\frac{dw_{ir}}{dL_r} \leq 0$ and $\frac{dw_f}{dL_r} \leq 0$ it will be true that $\frac{dQ_i^S}{dL_r} > 0$.

A positive shock of refugees will increase (or at least not change) formal and informal pro-duction if it increases product prices (or does not change) and reduces (or does not change) wages.

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