


RESEARCH PAPER

Can refugees improve native children's health?: evidence from Turkey

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Abstract

Following the most dramatic migration episode of the 21st century, Turkey hosted the largest number of Syrian refugees in the world. This paper assesses the impact of the arrival of Syrian refugees on the Turkish children's health, with a focus on height – a standard nutritional outcome. Accounting for the endogenous choice of immigrant location, our results show that Turkish children residing in provinces with a large share of refugees exhibit a significant improvement in their height as compared to those living in provinces with fewer refugees. Against other potential channels, a refugee-induced increase in maternal unemployment and the associated increase in maternal care seem to explain the observed positive effect on children's health.

Keywords: anthropometric measures; child health; labor market outcomes; refugees

JEL Classification: O15; I15

1. Introduction

Civil wars and natural disasters constitute immediate sources of forced migration, leading millions of people to leave their home country. The total number of refugees who have been displaced from their country of birth reached almost 89.3 million at the end of 2021, half of whom are reported to be children (United Nations High Commissioner for Refugees, 2021). Unprecedented immigration waves, such as those ignited by the Syrian civil war, can affect the well-being of local inhabitants through various channels, including their health conditions. On the one hand, threats include disease transmission due to refugee mobility, depletion of natural resources, reduced per capita availability of healthcare facilities and healthcare professionals, and environmental degradation (Maystadt et al., 2019). Particularly, in the case of children, the combined impact of such factors is likely to induce a deterioration in health outcomes during early stages of life. On the other hand, the refugee inflow may boost the welfare of the host population and accelerate local economies through increased demand, the flow of financial/humanitarian aid from intergovernmental

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organizations, and infrastructural improvements (Aygün et al., 2021; Erten et al., 2022). Delving into whether the benefits outweigh the costs is ultimately an empirical question, as these channels work in unique directions and the magnitude of their effects is largely unknown.

We aim to explore the effect of Syrian refugee inflow on Turkish native children's anthropometrics, focusing on the *z*-score of height-for-age (HAZ), using 2008, 2013, and 2018 rounds of the Turkish Demographic and Health Survey (TDHS). Using an Instrumental Variable approach, we show that the Turkish children residing in provinces with large refugee share improve their HAZ: the estimated quasi-elasticity ranges between 0.02 and 0.03 (in terms of *z*-score standard deviations). The positive effect persists even after a series of robustness and sensitivity checks. Placebo checks confirm the causal interpretation to be given to our results. The observed positive impact contrasts with previous findings in the related literature. For example, Baez (2011) and Dagnelie et al. (2023) report an adverse effect of the immigration shock on the native children's anthropometrics in Tanzania and in 29 African countries, respectively. This contradiction is fairly puzzling. We therefore examine several alternative channels to elucidate the observed positive effect.

The hypothesised mechanisms consist of changes in the supply of healthcare resources, mother's labor market outcomes, income, time allocation, quality–quantity trade-off, and investment in children's human capital through vaccination. The labor market and associated mothers' time for child care channels are found to be the most plausible explanation. We show that Turkish mothers who reside in provinces with a large share of refugees are less likely to be in the labor force at the time of the survey. Similarly to Tumen (2018), we find that refugees reduce the odds of low-educated Turkish mothers being on the labor market. That is explained by strong labor substitution since refugees are – on average – low-skilled and are willing to take low-pay jobs. Paradoxically, improvements in anthropometric indicators are concentrated in households where low-educated mothers seem to have been replaced by Syrian immigrants in the workplace. Such a mechanism may seem surprising. However, it has been documented in other contexts that maternal unemployment – in particular among low-skilled mothers – may boost the quality of maternal time to spend with their offspring and have positive repercussions on their children's health (Mosca et al., 2017; Danzer Lavy, 2018; P. M. Anderson et al., 2019). For example, maternal unemployment can result in more frequent utilization of healthcare resources, better maternal supervision through the provision of rich-nutrition diets or through the longer duration or exclusivity of breastfeeding, each of which can positively contribute to the physical growth of children. Taken together, we attribute the positive health effect of the refugee inflow to migration-induced maternal unemployment among the least skilled mothers.

Our contribution is twofold. First, we provide evidence of the health effects of the largest migration movement of the 21st century. The existing evidence mainly focuses on refugee camps in Africa (Baez, 2011; Dagnelie et al., 2023). In the Middle East, most refugees are dispersed in their hosting countries (UNHCR, 2022). It is unclear how such a dispersion matters. On the one hand, the dispersion of refugees may reduce the risk of disease transmission and potential competition in accessing resources such as clean water, sanitation, or basic health services (Maystadt et al., 2019; Clemens Ginn, 2020). On the other hand, the concentration of refugees in camps may facilitate the provision of basic health services and facilitate the control of communicable diseases. In Turkey, two papers touch upon the health

consequences of hosting refugees. Aygün et al. (2021) investigate the impact of refugees on healthcare system and mortality outcomes (i.e., infant, child, and elderly mortality). Their results suggest that Syrian refugees placed a considerable burden on healthcare system, despite the central government's investments in the physical and human capital indicators of healthcare resources in response to refugee shock. However, their estimates report no evidence of an impact on the Turkish natives' mortality outcomes. Erten et al. (2022), in turn, mainly concentrate on the vaccination outcomes of native children in addition to the prevalence of infectious/non-infectious diseases among native children. Their benchmark results document a drastic reduction in the probability of being fully immunized against hepatitis B, tuberculosis, and measles. They attribute their findings to the refugee-induced supply constraints in the healthcare resources. Although we will discuss potential effects on the supply of healthcare services and mortality, our article focuses on the anthropometrics of children, that is, the HAZ z -score, a standard outcome in health economics¹ Improved early life health outcomes and sufficient nutritional intake are key to explain later life outcomes such as better cognitive abilities, higher wages in the labor markets, and reduced health risks (Case Paxson, 2010; Currie Vogl, 2013). A change in mortality and health care resources is difficult to interpret without knowing the impact on children's nutritional status, and inversely. Our paper also sheds light on the mechanisms that drive possible health impacts of refugees. Existing studies emphasize the transmission of diseases such as malaria in Africa (Dagnelie et al., 2023), or other vaccine-preventable diseases (e.g., chickenpox and tuberculosis) and sexually transmitted diseases (e.g., syphilis) in Latin America (Ibáñez et al., 2021), and/or overburdened healthcare resources (Tatah et al., 2016; Aygün et al., 2021; Erten et al., 2022). Against these channels, we highlight the role of another mechanism through which immigration can affect health outcomes: the labor market channel and the associated mother's time allocation.

The remainder of this paper is structured as follows. Section 2 provides information on the arrival of Syrian refugees in Turkey and their integration into the Turkish healthcare system. Section 3 provides a description of the data. Section 4 elaborates on the identification strategy. Empirical results are presented in Section 5 while potential mechanisms are explored in Section 6. Finally, the last section discusses the findings and the need for extended child care in Turkey.

2. Background

2.1. Syrian refugees

The Syrian civil war sparked in March 2011, resulting in a forced displacement of 7.5 million Syrian individuals. Due to the geographical proximity and the open-door policy of the Turkish government, Turkey has become the main destination for Syrians (Ferris Kirisci, 2016). The open-door policy is of paramount importance, as it eliminates any attempt to enter the country illegally. In the early wave of the refugee influx, Syrian refugees, under temporary protection, were placed in refugee camps. Although the Turkish government has established 26 refugee camps in 10 provinces that provided housing to more than 270,000 Syrians by the end of 2013 (Benner et al., 2015), the uninterrupted nature of refugee inflow put a heavy burden on the capacity of camps

¹There is a long tradition in economics to utilize anthropometric data as an ultimate measure of children's health status (Alderman et al., 2006; Bundervoet, 2009; Akresh et al., 2011)

in 2014. The number of refugees reached 2.5 million in 2015, and 3.5 million in 2018 (Erdoğan, 2014; Akbulut-Yuksel et al., 2022). The massive increase resulted in the spread of refugees in 81 provinces of Turkey. As of 2019, the share of refugees residing in camps was 2.4%. In 2019, Istanbul, the most populous province in Turkey, hosted the largest number of refugees, amounting to 548,000 individuals. Istanbul was followed by provinces close to the Syrian border (e.g., 443,000 in Gaziantep and 431,000 in Sanliurfa, and 430,000 in Hatay) (Ministry of Interior (MOI), 2022). Unlike other countries that have a border with Syria (e.g., Jordan and Lebanon), Turkey has experienced a significant increase in the number of refugees overtime. Figure 1 depicts time series pattern of the number of officially registered Syrian refugees in Jordan, Lebanon, Egypt, and Turkey. It is obvious from Figure 1 that Turkey continues to host the largest number of immigrant populations among the other host countries.

2.2. Syrian refugees in Turkish health system

Refugees came to Turkey in need of healthcare. In addition to forced displacement, property damages, and economic destruction, the civil conflict in Syria resulted in a dramatic deterioration of healthcare services. Kherallah et al. (2012) report that both civilians and healthcare professionals have experienced severe physical injuries and mental health deteriorations including post-traumatic stress disorder. Furthermore, the war prevented healthcare facilities from operating effectively. According to WHO (2012), in the second year of the war, almost 40% of the hospitals were out of service and nearly 65% of the healthcare providers left their home country. Thereby, victims that were in urgent need of medical intervention were barely treated. WHO (2012) also state that the war left Syrians in an insanitary environment due to

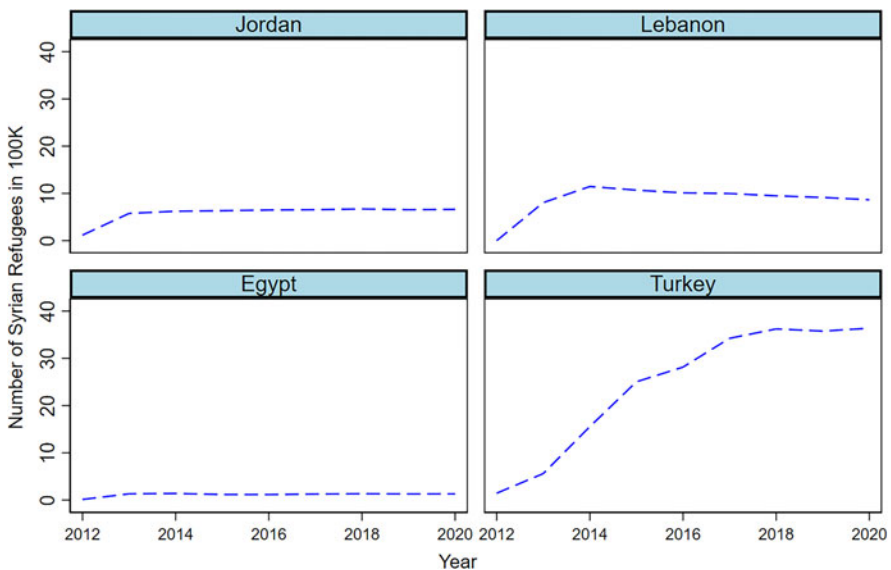


Figure 1. Total number of refugees (in 100 K) by country,. Notes: The data on the registered number of refugees comes from the UNHCR.

limited access to medical services, food, and drinking water. Resource constraints and unhygienic living conditions are known to increase the risk of epidemic diseases. WHO (2012) therefore warns that Syrians constitute a significant threat to the public health of host communities when considering the risk of spreading epidemic diseases such as measles and tuberculosis. The prevalence of measles, tuberculosis, and malaria have been reported to increase among countries providing temporary protection to Syrian refugees (WHO, 2012). For the Turkish case, the number of chickenpox, measles, tuberculosis, and hepatitis A cases increased both inside and outside of the camps. However, the incidence rate of these diseases among Syrian immigrants was found to be considerably larger as compared to the Turkish natives (Leblebicioglu, 2016; Ekmekci, 2017).

The Turkish government has adopted an ambitious response to the provision of healthcare services to forcibly displaced Syrian people who were in immediate need of medical treatment (Aygün et al., 2021). According to the existing policy, Syrians can benefit from any type of healthcare facility (e.g., preventive healthcare facilities, emergency departments, first-, second-, and third-step healthcare centers) in their province of registration with full coverage of medical and treatment costs. Syrian immigrants under temporary protections are recognized as the beneficiaries of universal health coverage just as the Turkish native population. In addition, the Turkish government began to set up Health Centers for Refugees (HCR) in 2017. In the 29 provinces of Turkey, the government recruited native Syrian healthcare professionals (i.e., more than 700 doctors and 900 nurses) and bilingual healthcare professionals (European Commission, 2006; Aygün et al., 2021). Nevertheless, the majority of HCRs were established after the implementation of the Supporting Immigrant Health Services Project (SIHSP), which was fully funded by the European Union (EU). Prior to the SIHSP, the number of HCRs located in provinces with a larger share of immigrants was limited to six.

Risks of health congestion were reported. For example, Savas et al. (2016) conducted a survey to investigate the effect of Syrian individuals on the workload of healthcare professionals in one of the provinces with a large share of refugees, Hatay. Their results indicate that waiting time at hospitals and healthcare providers' hours worked significantly increased because of the Syrian patients. This study also highlights two crucial issues. First, intensive care units became insufficient in capacity, again due to Syrian patients. Second, the prevalence of infectious diseases, hospitalization rates, and intensive care receipts are found to be much higher among Syrian patients compared to Turkish patients. Nevertheless, Aygün et al. (2021) take this survey-design study one step further by combining several administrative data sources. They provide suggestive evidence indicating that adult intensive care beds decline in per-capita terms. Similarly, WHO (2019) reports that almost 40% of patients in hospitals in (Turkish) provinces that have a border with Syria are Syrian individuals. Therefore, provinces with higher refugee shares are more likely to encounter capacity problems, and the native population should be at higher risk of having infectious diseases. The breadth of the European Union (EU) financial assistance was nonetheless not negligible when considering the scope of the EU Facility for Refugees in Turkey (FRIT). The FRIT aims to ensure the socioeconomic well-being of Turkish natives as well as Syrian refugees. Knowing whether increased household income induced by external financial aid can compensate for potential negative effects on children's nutrition remains an empirical question.

3. Data and descriptive statistics

This paper combines two types of data for the empirical analysis: (1) individual level data on the Turkish native children's health outcomes as measured by anthropometric information, (2) 81-province level data on the Syrian refugee inflows as well as other province-level information such as the number of physical capacity indicators of healthcare (i.e., number of hospital beds and number of hospitals), public expenditure, GDP per capita, and a terrorism index as a measure for local violence intensity.

3.1. Data on children's anthropometric indicators

The primary source of data is the 2008, 2013, and 2018 waves of the Turkish Demographic and Health Survey (TDHS), each of which is a nationally representative cross-sectional survey. The TDHS provides comprehensive information on women of reproductive age (15–49) who gave birth in the five years preceding the survey year and their offsprings. Collected information includes, but is not limited to, household characteristics (e.g., information on household head and wealth index), demographics of mothers and their children (e.g., sex, age, birth year/month, and education), mothers' marriage history (e.g., marital status and age at first marriage), fertility outcomes (e.g., current fertility, children ever born and living, and age at first birth), and utilization of healthcare services (e.g., antenatal/postnatal care visits, vaccination) and child health and nutrition (e.g., height and weight).

A vital dimension of early childhood welfare, proximate predictor of human capital formation, is investigated in our paper: nutrition. According to international standards (WHO, 2006), HAZ z-scores can be calculated for 5892 children, due to either rejection of height measurement and the absence of the child (ren) at the time of the survey. However, our operating sample consists of 5341 children under the age of five, as we exclude those who were born in year 2012. The reason why we exclude the year 2012 from our empirical analyses is the lack of refugee data (see Section 3.2). It is also of great importance to indicate that anthropometric information is only available for the last-born children, who are below the age of 5. The HAZ, given sex, is a widely used indicator of child health in the long term. A low HAZ reflects the cumulative impacts of chronic malnutrition, stunting, and infections before and after birth. Being stunted, more prominent under five years of age, is considered to originate from food intake at sub-sufficient levels over a prolonged period, vitamin and/or protein deficiencies, co-existence of multiple diseases, and the poor health status of mothers during gestation. Table 1 shows the descriptive statistics on the Turkish children's HAZ z-scores. On average, a child in Turkey is 0.334 standard deviation shorter during the sample period in refugee-dense provinces. Interestingly, the HAZ z-scores, on average, have improved after the immigration shock. The magnitude of this improvement is higher in refugee-dense provinces.

3.2. Data on refugees and time varying province attributes

Data on the number of refugees in Turkish provinces come from the Directorate General of Migration Management (DGGM). Before 2012, there were almost no Syrian refugees in Turkey, although there were officially registered refugees and asylum seekers from different countries. For example, UNHCR (2011) reports that there were 14,465 refugees in Turkey in 2011 whom of 6,600 were from Iraq. For the

Table 1. Children's anthropometric indicators by native-to-refugee ratio density in provinces (excluding 2012)

	(1)	(2)	(3)
	Entire period	Before Syrian crisis	After Syrian crisis
	(2003–2018)	(2003–2011)	(2013–2018)
High-density	−0.371	−0.437	0.048
	(1.709)	(1.669)	(1.664)
Observations	1,264	787	477
Low-density	−0.277	−0.449	0.004
	(1.602)	(1.653)	(1.518)
Observations	4,077	2,530	1,547

Notes: The data come from Turkish Demographic and Health Survey (TDHS) 2008, 2013, and 2018. The entries are at means. Standard deviations are in parentheses. High intensity provinces are as follows: Kilis, Hatay, Sanliurfa, Gaziantep, Mardin, Sirnak, Osmaniye, Kahramanmaras, Mersin, Adana, and Adiyaman.

particular case of Syrian war victims, their arrival in Turkey began in July 2012 (Akbulut-Yuksel et al., 2022). However, refugees have been placed in refugee camps in Turkish provinces having a border to Syria in 2012. As a result, data on the number of refugees at the province level, and therefore treatment, start in 2013.² We also divide the number of refugees by the province-level 2010 population. Population data, at the 81 province-level, are obtained from the Turkish Statistical Institute (TSI). Figure 2 shows the spatial distribution of Syrian refugees per inhabitant across 81 provinces of Turkey in the years 2014, 2016, and 2018, respectively. As discussed in Beine et al. (2021), refugees progressively move to other regions, especially to industrialized and western provinces such as Istanbul. Besides, in 2018, a substantial portion of the dark-green shades still appear in provinces having either a border or close to Syria. This highlights the importance of distance as a significant factor in determining the location of Syrian refugees in Turkey (Beine et al., 2021).

As indicated in Figure 2 and already documented by Aygün et al. (2021) and Aksu et al. (2022), refugees tend to locate in provinces that either have a border to Syria or are close to Syrian border (i.e., Southeastern provinces). With a few exceptions (i.e., Adana, Gaziantep, and Mersin, which are important epicenters of industrial economy), refugees tend to locate in provinces that are relatively less developed such as Kilis, Hatay, Sanliurfa, Osmaniye, and Kahramanmaras (i.e., mainly east part of Gaziantep province). Such a negative selection is common in refugee studies (Maystadt Verwimp, 2014; Wahba, 2014; Kadigo Maystadt, 2023). Therefore, we can anticipate that native children should have worse HAZ *z*-scores in refugee-dense provinces, at least before the refugees arrive. The descriptive statistics in Table 1 confirm that prior to 2012, HAZ *z*-scores are lower in provinces with larger share of refugees.

²That is why the year 2012 is excluded from the main analysis. Although there were refugees in Turkey from July 2012, their number at the province level is not available in 2012. Therefore, the corresponding number cannot be calculated and remains missing for the native children born in 2012. In other words, each empirical specification excludes the children whose year of birth is 2012. We assess the importance of this sample restriction in Section 5.2.

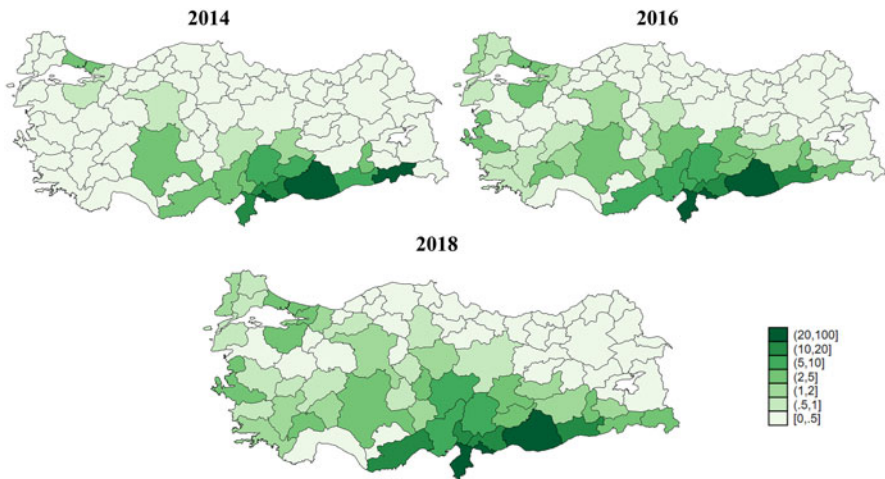


Figure 2. Spatial distribution of Syrian refugees (in percent). *Notes:* Data on native population come from the Turkish Statistical Institute while the data on refugees come from Presidency of Migration Management. This figure shows the ratio of the Syrian refugee population to the province native population in Turkey for 2014, 2016, and 2018, respectively.

There exist several factors at the local level that could affect health status and be correlated with the presence of refugees. We use the following time-varying province controls: (1) the number of hospitals per 1,000 inhabitant, (2) public expenditure per 1,000 inhabitant, and (3) an index for terrorism. The first two variables are included to take into account public capacities in the provision of healthcare services and other local public goods. Given the high risk of terrorism in Turkey, the last index aims at capturing the later-life health consequences of early-life shocks related to terrorism. Terrorism threats have indeed been found to impair later life outcomes, including children's anthropometry (Camacho, 2008; Ekhatior-Mobayode Abebe Asfaw, 2019; Grossman et al., 2019). Since these variables can also act as bad controls (J. D. Angrist Pischke, 2009), these variables will be added parsimoniously in our main specifications.

Data on the number of hospitals come from the Turkish Statistical Institute (TSI). Public expenditure data are obtained from the Turkish Republic Presidential Strategy and Budget department.³ Overall, the supply of health services or the level of public expenditures have improved over the period of investigation (see Appendix Table A.1). The observed improvement – irrespective of the arrival of refugees – can be attributed to the Health Transformation Program (HTP) implemented by the Turkish Ministry of Health (MoH) between 2003 and 2013, and the Health System Strengthening and Support Project supported by the World Bank since 2015.⁴

³Other data on the number of doctors, nurses, midwives and hospital beds are used in Section 6. The data can be found in <https://www.sbb.gov.tr/yatirimlarin-illere-gore-dagilimi/>. The expenditures are at current prices.

⁴Even though the HTP has been implemented between 2003 and 2013, it has positive and long-lasting effects on the healthcare system. Detailed information can be obtained through <https://csep.org/wp-content/uploads/2022/09/Health-Systems-in-Transition-TURKEY-1.pdf>. Relevant information on the scope of the Health System Strengthening and Support Project can be accessed via <https://documents>.

A terrorism index is constructed using data from the Global Terrorism Database (GTD). The GTD provides comprehensive information on the terror events that took place in each province: (1) the number of incidents, (2) the number of fatalities, (3) the number of injuries, and (4) the number of property damage. These four measures and the formulation provided by Vorsina et al. (2017) are utilized to construct the terrorism index.⁵ According to the Appendix Table A.1, the inflow of refugees has coincided with a rise in terrorist risk.⁶

4. Identification strategy

Our research design seeks to compare the average health outcomes of children exposed to the presence of refugees with children who are not (or less) exposed. More specifically, a naïve empirical specification can be presented as follows:

$$Health_{icrt} = \beta Refugee\ Share_{ct} + \theta H'_{ict} + \gamma X'_{ct} + \alpha_c + \alpha_t + t_r + \epsilon_{icrt} \quad (1)$$

$Health_{icrt}$ is the health outcome of the child i , residing in province c (and region r) in year t . $Refugee\ Share_{ct}$ denotes a continuous treatment variable capturing the exposure to the presence of refugees for the child i leaving in province c . Exposure to refugee shock is determined by the number of refugees in the province of residence of the children at the time of birth, divided by the 2010 population of the province c . Since our main variable of interest has an abundant number of zeroes, in particular prior to 2013, we apply an Inverse Hyperbolic Sine (IHS) transformation.⁷ We control for individual and household observed characteristics (H_{ict}) including child's sex, child's month of birth, mother's age, mother's age square, mother's education, whether the mother resides in a rural area, the total number of older siblings, being a female headed household, and the wealth index. The vector of coefficients γ will capture the impact of time varying province attributes, namely (log) hospitals per 1,000 inhabitant, (log) public expenditure per 1,000 inhabitant, and the terrorism index. α_c stands for province fixed effects to control for any time-invariant heterogeneity across 81 provinces. α_t denotes survey year fixed effects to account for any macroeconomic shocks at the national level. The specification will be further

worldbank.org/en/publication/documents-reports/documentdetail/534641468190775240/turkey-health-system-strengthening-and-support-project

⁵Following Vorsina et al. (2017), the terrorism index is calculated based on the following formula. Terrorism Index = $(1 \times \text{Incidents}) + (3 \times \text{Fatalities}) + (0.5 \times \text{Injuries}) + (2 \times \text{Property Damage})$. The terrorism index has a minimum of 0 and a maximum of 754.5 (mean = 21.34 and SD = 87.28). To minimize the variation, the terrorism index is rescaled between 1 and 10 (mean = 0.15 and SD = 0.82).

⁶To alleviate the ethnoprovince-led terror incidents in Turkey, the ruling party (i.e., Justice and Development Party (JDP)) has started a "peace" process with the Kurdistan Workers' Party (PKK) in 2009. Despite significant declines in the number of PKK-induced terror events in Turkey between 2012 and 2013, Turkish government's military operations to destroy PKK camps, warehouses, and shelters dissolved the peace process (Köse et al., 2019). Since then, terrorist attacks have followed an increasing trend.

⁷We mainly hinge on the IHS transformation to ease the interpretation of our results. In applied economics, it is a widespread practice to transform right-skewed variables (e.g., the refugee-share variable) that include zero and/or negative values. One popular transformation practice is to take the logarithm of such a variable. Nevertheless, one potential problem of taking the logarithm of a variable is that it does not allow retaining zero-valued observations as $\ln(0)$ is undefined (Bellemare Wichman, 2020). We show that our main results do not change, without such a transformation in Section 5.2.

augmented with region-specific time trends, t_r (and alternatively with region-year fixed effects).⁸ ϵ_{icrt} stands for the error terms. Standard errors are clustered at the 81-province level. Individual sampling weights are also used to render our results nationally representative.

Despite controlling for observed and unobserved characteristics, a challenge in comparing children with different levels of exposure to the presence of refugees at birth is that the location of refugees is not random. Refugees have indeed been found to move within Turkey, even if they appear to be particularly sensitive to variations of income at origin and distance (Beine et al., 2021). Refugees may therefore prefer to move to provinces with employment opportunities and better healthcare. The opposite is also possible. We cannot exclude that refugees are forced to settle in peripheral areas in which local hosts feature worst health conditions compared to the rest of the country.⁹ Syrian refugees might also prefer to locate in less populous and small-sized provinces to minimize their living costs. If labor market opportunities and government services are relatively limited in such provinces, then the coefficients obtained through the OLS model would be downward biased.

The endogenous choice of the refuge location makes it essential to instrument the exposure of Turkish children to the immigration shock. To account for the potential endogeneity of immigrant location decisions, we use a distance-based instrument following Del Carpio Wagner (2015). The instrumental variable approach is based on the rationale that the travel distance from the Syrian governorate from which Syrian immigrants take the road to each province in Turkey is central in predicting their settlement decisions. The gravity models of migration posit that the farther the two locations are from each other, the lower the spatial interaction, or namely migration, between them (J. E. Anderson, 2011; Beine et al., 2021).

The TDHS provides data on the province of residence of the respondents at the time of survey. It allows us to calculate the cross-border variation in travel distance between 81 provinces in Turkey and 13 governorates in Syria.¹⁰ Following Del Carpio Wagner (2015), the distance-based instrument for the Turkish children's exposure to Syrian refugees for each province in Turkey can be represented as follows:

$$Distance\ Instrument_{ct} = \sum_{i=s} \frac{1}{\eta_{sc}} \phi_s S_t \quad (2)$$

⁸Turkey counts 5 regions (i.e., North, South, East, West, and Central). Due to multicollinearity (Variance Inflation Factor (VIF)=70, well above the rule-of-thumb of 10, it leads to severe serial correlation), survey years are used instead of year of birth for time indicators. We therefore introduce 5 region-specific time trends and alternatively, 5 region-year fixed effects following Erten et al. (2022). We also assess the sensitivity of our results to the use of more disaggregated subnational divisions in Section 5.2.

⁹Based on observed characteristics, it is not obvious to quantify the direction of such an endogeneity bias. We indeed explore whether there exists a systematic association between the presence of refugees and the characteristics of Turkish provinces (Akbulut-Yuksel et al., 2022). We follow Akbulut-Yuksel et al. (2022) in regressing the (log) number of refugees on the following province-level characteristics: native population, number of hospitals per 1,000 inhabitant, public expenditure per 1,000 inhabitant, and terrorism index. The results are reported in Appendix Table A.2. Results suggest that refugees are attracted by larger provinces, but there is no clear pattern with the (log) number of hospitals, public expenditure per 1,000 or the threat of terrorist attacks. Although not precisely estimated, the correlations rather suggest that refugees move to places with deteriorating healthcare.

¹⁰There are 13 origin governorates in Syria: Aleppo, Al-Hasakah, As-Suwayda, Damascus, Daraa, Deir-zor, Hama, Homs, Idlib, Latakia, Quneitra, Rakka, and Tartus.

where η_{sc} denotes the shortest travel distance (measured in kilometers using Google Maps) from each origin Syrian governorate s to a Turkish province c . As noted by Erten et al. (2022), there are six border crossing points from Syria to Turkey, two in Hatay and the other four in Gaziantep, Kilis, Sanliurfa, and Mardin provinces. Therefore, choosing between these border crossing points are contingent upon the Syrian individuals' governorate of residence and the intended province of arrival in Turkey. Due to the Turkish government's open-door policy toward Syrian refugees, there was no incentive for them to target one particular border crossing point while entering Turkey. Hence, the distance measure between 81 Turkish provinces and 13 Syrian origin governorates considers the shortest travel pathway. ϕ_s shows the share of Syrian population in each origin governorate s in the pre-immigration period (i.e., 2010)¹¹, and S_t is the total number of officially registered Syrian refugees in Turkey in year t (measured in thousands). There are 1053 origin-arrival pairs to construct the Instrumental Variable (IV).¹² The instrument is also standardized in order to ease the interpretation of the first-stage results.

The IV method relies on the identifying assumption that the instrument has no correlation with the unobserved trends in the outcome variables. For instance, such assumption may be threatened when the instrument is correlated with the latent trends in macroeconomic indicators (e.g., (un)employment). Such trends could also affect the Turkish children's anthropometrics. Furthermore, Western region of Turkey is considerably more developed as compared to Eastern region, which is close to border crossing points. If the time trends in children's health outcomes in Western region of Turkey differ from that of Eastern region, then the identifying assumption will no longer hold. To minimize that threat, we follow Aygün et al. (2021) in using time–region interactions to weaken the independence assumption. We further discuss the validity of our instrumental variable approach in Section 5.3.

5. Empirical analysis

5.1. Main results

Table 2 presents the effect of refugees on children's nutritional status, as measured by the HAZ z -scores. Columns (1)–(3) show the OLS estimates. Columns (4)–(6) display the 2SLS results. In panel A, we only include survey year and province fixed effects. In panels B and C, we gradually add different sets of control variables. The first stage F -statistics (or, Kleibergen–Paap rk Wald F) are reported in columns (4)–(6), each of which is sufficiently large. This confirms that the distance-based instrument is strong enough for proper identification.

Unlike previous findings in the African context (Baez, 2011; Dagnelie et al., 2023), the 2SLS estimates suggest a positive effect of refugee inflow at 1% significance level in each panel, regardless of the specification.¹³ Turkish children residing in provinces with

¹¹Pre-war populations of the Syrian governorates in 2010 are obtained from the Syrian Arab Republic Central Bureau of Statistics.

¹²There are 81 provinces in Turkey and 13 origin governorates in Syria, amounting to 1053 origin-arrival pairs (i.e., $81 \times 13 = 1053$).

¹³Our results also contrast with these existing studies if we replace our dependent variable with an alternative nutritional outcome: the weight-for-age. The WAZ, given sex, is a measure of child health in the short run. Low levels of WAZ imply wasting and thereby the presence of current protein-energy malnutrition. We prefer HAZ over WAZ to proxy the Turkish children's health based on two reasons. First, HAZ is more appropriate for our research design (WAZ being a short-term indicator and much

Table 2. Effect of refugees on children's HAZ (excluding 2012)

Dep. Var.	Height-for-age z-scores (HAZ)					
	OLS			2SLS		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A	Without controls					
Refugee share (IHS)	0.0991***	0.0555*	0.0662**	0.6404***	0.7864***	0.8257***
	(0.0325)	(0.0295)	(0.0329)	(0.1970)	(0.2141)	(0.2195)
Elasticity	0.0036	0.0021	0.0024	0.0238	0.0293	0.0307
Kleibergen–Paap rk Wald <i>F</i>				19.07	25.18	26.53
Panel B	With individual and household controls					
Refugee share (IHS)	0.0959**	0.0533	0.0600	0.6198***	0.7623***	0.7961***
	(0.0387)	(0.0354)	(0.0382)	(0.1845)	(0.2040)	(0.2085)
Elasticity	0.00357	0.00198	0.00224	0.0231	0.0284	0.0296
Kleibergen–Paap rk Wald <i>F</i>				19.41	25.96	27.24
Panel C	With province-level, individual, and household controls					
Refugee share (IHS)	0.0454	0.0243	0.0193	0.5133***	0.6515***	0.6669***
	(0.0286)	(0.0333)	(0.0322)	(0.1675)	(0.1873)	(0.1852)
Elasticity	0.0016	0.0009	0.0007	0.0191	0.0243	0.0248
Kleibergen–Paap rk Wald <i>F</i>				18.08	24.25	24.15
Observations	5,341	5,341	5,341	5,341	5,341	5,341
Year FE	Y	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y	Y

Region trends	N	Y	N	N	Y	N
Region-year FE	N	N	Y	N	N	Y

Notes: Data come from Turkish Demographic and Health Survey (TDHS). The full sample is for the 2003–2018 period, excluding 2012, at the 81-province level. The 2SLS model instruments the refugee share utilizing a distance-based instrument. Individual and household controls include child's sex, child's month of birth, mother's age, mother's age square, mother's education, whether the mother resides in rural area, total number of older siblings, being a female headed household, and wealth index. Time-varying province controls include (log) public expenditure per 1,000 inhabitant, number of hospitals per 1,000 inhabitant, and terrorism index. Individual survey weights are used in each specification. Standard errors, clustered at the 81-province level, are in parentheses. *** denotes statistical significance at the 1% level ($p < 0.01$), ** at the 5% level ($p < 0.05$), and * at the 10% level ($p < 0.10$), all for two-sided hypothesis tests.

larger refugee share are on average taller than others.¹⁴ The estimated quasi-elasticity stands at 0.0296 in our preferred specification with individual/household-level controls (see column (6) in panel B of Table 2). Increasing the presence of refugees by 10% (equivalent to an increase by about 2,900 refugees from the mean) boosts children's height by one-third of a standard deviation ($0.0296 \times 10 = 0.296$). Although with the reverse sign, the magnitude is slightly higher than the quasi-elasticity of -0.02 found by Dagnelie et al. (2023). Although the magnitudes and the corresponding quasi-elasticities become slightly smaller in panels B and C, we still observe a notable improvement in HAZ when gradually adding (i) individual/household-level and (ii) province-, individual/household-level control variables. For presentation purposes, we relegate the estimated coefficients for the full set of control variables (i.e., panel C of Table 2) in Appendix Table A.3. Results are mostly as expected with positive and significant coefficients for proxies for healthcare supply, education, and wealth. The number of older siblings has a negative and significant effect on HAZ.

5.2. Robustness checks

The results of our estimation may be sensitive to the model's specification. Therefore, we check the robustness of our results to (a) alternative transformations of our dependent variable and our variable of interest, (b) the use of more requiring region-time trends and fixed effects; and (c) alternative samples.

Alternative transformations. We may be concerned by extreme values in our dependent variable. The literature defines biologically plausible values of HAZ z -scores, which lie between -6 and $+6$ (Mei Grummer-Strawn, 2007). We show that our main results are robust to the exclusion of biologically implausible values of the HAZ z -scores (see Appendix Table A.5). Another potential concern might be related to the utilization of IHS transformation in refugee share variable. To rule out the possibility that IHS might distort our results, we re-estimate our main results shown in Table 2 where IHS transformation is not applied to the refugee share variable. As can be seen from Appendix Table A.6, the positive effect on the HAZ remains the same without IHS transformation.

Alternative time trends. Having data at the 81-province level allows us to utilize more flexible trends than region trends, such as trends at the NUTS-1 (i.e., 12 regions) or even NUTS-2 level (i.e., 26 regions). We include these requiring time trends to make sure that our findings are not driven by differential pre-existing time trends across

more volatile). Accumulated (or long-run) effect of chronic malnutrition – due to either mentally or physically low levels of growth – is captured by HAZ, while WAZ shows the acute malnutrition induced by current undernutritional patterns. Second, being underweight childhood is easier to overcome in later stages of life than shortness in height-for-age. However, we replicate our results with that alternative indicator (WAZ) in Table A.4. The evidence still confirms the positive effect of refugees on children's health, as proxied with the WAZ z -score.

¹⁴The difference between the OLS and the 2SLS confirms the negative selection observed descriptively in Section 2.

regions. The results are presented in Appendix Table A.7 and Appendix Table A.8, confirming the improvement on the HAZ.

Alternative samples. The definition of our sample of interest may be questioned. Due to a lack of refugee data, we decided to exclude the year 2012. We re-estimate the main specifications including the year 2012, replacing missing information on refugees by zeroes. Results remain similar (Appendix Table A.9).

5.3. Plausibility of identification assumptions

Our identification strategy rests on key identification assumptions. First, we assume that there is no confounding trends in health outcomes between provinces with high and low values of refugee shares or the instrument, conditional on the use of fixed effects and control variables. Second, we assume that the composition of the treated and control provinces remains constant overtime. The stability of our 2SLS coefficients when controlling sequentially for province-level, individual, and household characteristics is reassuring but only deals with *observed* changes. The stability of our sample composition may be threatened by several selection issues. We discuss the plausibility of both assumptions below, distinguishing between selective migration, selective marriage, selective fertility, and selective mortality as threats to the second assumption.¹⁵

Confounding trends. Adding region-specific time trends may not be sufficient to assume that Turkish children residing in provinces with large (predicted) share of refugees follow a similar trend in their HAZ *z*-scores compared to children in provinces with lower share of refugees. Therefore, we assess the presence of pre-existing trends using two different exercises (i) quantifying the effect of the future exposure to refugee shock on the current HAZ *z*-score of Turkish children (i.e., using the forward values of the refugee share and the instrument) and (ii) following Aksu et al. (2022)'s Placebo exercises. First, we restrict the sample to children born before 2008 and assign the 10 lagged values of the refugee share and the distance-based instrument for each province. In Appendix Table A.10, we find a positive correlation with the OLS estimates but the estimated 2SLS coefficients are all statistically insignificant. Overall, such a placebo exercise rejects the possibility that the positive effect found in our main results may be explained by pre-existing trends in HAZ *z*-scores. Second, we follow Aksu et al. (2022) in estimating the slope coefficient from a regression of residual trends of the dependent variable (i.e., HAZ) on the value of the time-constant instrument (i.e., 2016). As suggested by Jaeger et al. (2020), the aim of this Placebo approach is to assess whether pre-shock trends in the outcome variable

¹⁵Scholars have recently demonstrated the limits of two-way fixed-effects estimations in the presence of heterogeneous treatment effects (Athey Imbens, 2021; de Chaisemartin D'Haultfoeuille, 2020; Goodman-Bacon, 2021). Heterogeneity in our treatment over time is unlikely given that our refugee share only varies between 2013 and 2015. We confirm that intuition by implementing the approach proposed by Jakiela (2021). Building on the Frisch–Waugh–Lovell theorem, the homogeneity assumption requires the relationship between residualized outcome and treatment variable to be linear and to be constant across comparison groups. While confirming a positive coefficient for our average treatment effect, we do not find evidence that the treatment effect changes across comparison groups.

are independent of the instrument, after accounting for fixed effects, time trends, and/or control variables. The results are presented in Appendix Table A.11. In panel A, region-trends in columns (2) and (4) and region-year fixed effects in columns (3) and (5) are introduced using 5 regions of Turkey. In panels B and C, we introduce region-trends in columns (2) and (4) and region-year fixed effects in columns (3) and (5) using 12- and 26-regions of Turkey, respectively. Accros specifications, there is no correlation between the residual trends and the IV defined in 2016.¹⁶ In the rest of the paper, we focus on specifications with individual and household covariates, with or without region-specific trends and region-year fixed effects.¹⁷

Selective migration. Native displacement is a major concern in migration studies (Card DiNardo, 2000; Card, 2001; Borjas, 2006; Andersson et al., 2021). A massive outflow of natives may explain our results, in particular if those with a low socio-economic background (likely with poor health conditions) are leaving. To explore such a selective migration, we first note that Akgunduz et al. (2015) find lower in-migration rates and unchanged out-migrations in regions that hosted a large number of Syrian refugees in Turkey. Aksu et al. (2022) also find no impact on in-migration, with the exception of a positive impact for more-educated natives.¹⁸ With our data, we investigate whether the migration influx affects migration inflows and outflows based on the TSI's migration statistics at the 81-province level over the period of 2008-2018.¹⁹ Based on the results presented in Appendix Table A.12, we do not find evidence of native displacement as a result of the refugee inflows. Similarly, we do not report any evidence of outflows as a response to the inflows of refugees. However, we do find that low-educated natives are more likely to move in areas with a large share of refugees (see panel B, columns (2) and (3) of Appendix Table A.12).²⁰ If anything, the fact refugee-hosting areas act as an attraction force for the low-educated suggests that our main results would have been even more positive, if – as expected – low-educated natives are also associated with lower health outcomes for their children.

Selective marriage and selective fertility. Unprecedented population shocks, such as those triggered by the Syrian civil war, are known to potentially alter marriage market dynamics and fertility decisions of native women.²¹ The presence of refugees has the

¹⁶Similar results are found when the reference year of the instrument is changed to the year 2015 or 2014.

¹⁷We decide not to include the province-level controls systematically since they may act as bad controls. For instance, when investigating the importance of investment in healthcare resources, it does not make sense to control for likely endogeneous province-level controls such as the number of hospitals or public expenditure. Our results are nonetheless robust to the addition of province-level controls and available upon request. Similarly, individual controls are not included when estimating the impact of refugees on the age at first birth and the age at first marriage since the estimations are implemented at the mother level.

¹⁸Those results contrast with Elmallakh Wahba (2023) who found a considerable increase in native outflows in Jordan.

¹⁹The relevant information is available at <https://nip.tuik.gov.tr/?value=IllerArasiGoc>.

²⁰Our results contrast with Aksu et al. (2022). One possible reason is that our analysis uses different time periods.

²¹In the US context, the marriage markets and fertility can be explained by a change in sex ratios, for example, by making it easier for native women to find a spouse and to have child(ren) (J. Angrist, 2002). In our context, it is not a plausible mechanism even though the prevalence of poverty/

potential to impact patterns of family formation and fertility decision by modifying the employment opportunities and occupational status of native men and women (Carlana Tabellini, 2018). We cannot exclude the possibility of a selective change in our population of interest, since marriages and births at early ages have been linked with a number of adverse outcomes such as poorer maternal and child health, especially in developing countries [see Alam (2000) for India and Raj et al. (2010) for Bangladesh]. To test these possibilities, we explore the effect of refugee influx on Turkish women's age at marriage and age at first birth. In Appendix Table A.13, we report no evidence of a change in age at first marriage and age at first birth, indicating that our results are not driven by a change in family formation patterns.²² No evidence is also found when the sample is stratified between low- and high-educated mothers.

Selective mortality. The Fetal Origins hypothesis posits that in utero shocks (e.g., sub-optimal nutrition, wars, and weather shocks) impair fetal growth which in turn leads to a predisposition to have poorer health outcomes in later life (Almond Currie, 2011; Barker, 1990). Shocks in utero may also alter the composition of the population of interest (Dagnelie et al., 2018). In response to a detrimental shock during gestational age, a portion of fetuses lying at the bottom of the health distribution cannot survive since their initial health endowment does not exceed the survival cutoff (Dagnelie et al., 2018). We can therefore not exclude that in case of disproportionate mortality in refugee-hosting provinces, our positive effect would reflect the better health conditions of the surviving kids. We first note that such a selection is highly implausible since most of evidence has been found for large-scale shocks such as famine, conflict, or natural disasters (Almond Currie, 2011; Leon, 2012; Lavy et al., 2016; Dagnelie et al., 2018). We nonetheless test whether Syrian refugee shock affects the survival patterns during pregnancy, and thus the population composition. In Table A.14, we assess the likelihood of experiencing miscarriage and stillbirth among Turkish women. Our results do not yield a statistically significant effect on the probability of experiencing miscarriage and stillbirth (see columns (1) to (6) in Appendix Table A.14). Although not obvious in the studied context, induced abortion might also constitute another mechanism through which immigration can affect the composition of our sample and hence, native children's health. In Appendix Table A.14, we assess this possibility and report null results.²³

6. Investigating possible channels

Our findings contradict the existing research documenting either an adverse or a null impact of migration shocks on health outcomes (Montalvo Reynal-Querol, 2007; Baez, 2011; Ibáñez et al., 2021; Dagnelie et al., 2023). In the Turkish context, there exist two relevant studies exploring the health effects of forced migration. First,

unemployment among the Syrian refugees can be an encouraging factor for them to marry a Turkish citizen. Syrian refugees who are under Temporary Protection do not have the right to marry a Turkish citizen to gain citizenship (and hence an employment chance) by marriage. Relevant information can be found at <https://multeciler.org.tr/eng/common-misconceptions-about-syrians/>.

²²Note that we also assess the impact of refugees on the number of births in Section 6.3.

²³No evidence is found when the sample is stratified according to education level (see Appendix Table A.15).

Aygün et al. (2021) examine the health effects of Syrian refugee shock in Turkey, as proxied by Turkish natives' infant, child, and elderly mortality. Their OLS results provide suggestive evidence indicating that mortality outcomes exhibit an increasing pattern. Yet, once the endogenous location choice of Syrian refugees is accounted for, their IV estimates yield no evidence that forced migration affects mortality. The study indicates that Syrian individuals are more prone to locate in provinces for which, in the absence of the migration flow, mortality outcomes would follow a more negative trend over time. That being said, Erten et al. (2022) show that native children residing in provinces with larger refugee flows are less likely to be fully vaccinated against measles, hepatitis B, DTP, and tuberculosis. They also document that the native children living in refugee-intense regions are at higher risk of catching an infectious disease and upper/lower respiratory diseases. Taken together, the results displayed in this paper are sufficiently puzzling to require further investigation.

We explore a number of channels through which an unprecedented immigration crisis can affect health outcomes. These channels include (1) investment in healthcare resources, (2) Turkish mothers' labor market outcomes and their time allocation at home, (3) income channel, (4) and the quality–quantity trade-off channel as measured by the total number of births (either still or live birth) and investment in children's human capital through vaccination. To explore these channels, we keep similar OLS and 2SLS specifications and samples, than the ones explained in Section 4. The only differences are that some outcomes (healthcare) require to aggregate our data at the province level. Time-varying province attributes are omitted since they are likely to be endogenous to the outcome of interest related to healthcare resources, labor markets, income, the number of births, and investment in children's human capital.²⁴

6.1. Investment in healthcare resources

The most obvious explanation relates to changes in healthcare resources. We therefore explore the response of the central government to the refugee wave in terms of investment in human and physical healthcare resources in the refugee-hosting provinces. Using data from the TSI, we quantify the effect of refugees on the supply of healthcare resources at the 81-province level. The province-level healthcare indicators cover: (1) the number of doctors, (2) the number of nurses, (3) the number of midwives, and (4) the number of hospital beds. Descriptive statistics are shown in Appendix Table A.1.

We present our detailed results in Appendix Tables A.16 but a summary of the 2SLS results is provided in Table 3. The 2SLS estimates indicate that there is a significant increase in the number of doctors, nurses, midwives, and hospital beds. Overall, the results confirm that the central government responded to this migration shock by increasing the supply of healthcare professionals and hospital beds (see panel A of Table 3). However, one should be cautious when interpreting these results as the outcome variables are not in per capita terms. To proxy for the capacity to maintain sufficient healthcare services per inhabitant, we divide the healthcare outcomes by the total population, including both Turkish natives and Syrian refugees, in each province. When transformed in per capita terms, the effect is reversed for the supply of healthcare professionals and not significant for the number of hospital beds (see

²⁴Our results can nonetheless be shown to be qualitatively unaffected by the addition of these controls.

Table 3. Summary table I: investment in healthcare resources (2SLS results , with region-year FEs)

Dep. Var. Model	Healthcare resources			
	Doctor (1)	Nurse (2)	Midwife (3)	Hospital beds (4)
Panel A	(Log) number			
Refugee share (IHS)	0.9578*** (0.2288)	1.5942*** (0.2882)	0.9028*** (0.2420)	1.6573** (0.7046)
Elasticity	0.00081	0.00188	0.00111	0.00155
Kleibergen–Paap rk Wald <i>F</i>	16.81	16.81	16.81	16.81
Panel B	Per 1,000 inhabitant			
Refugee share (IHS)	−0.9078*** (0.2540)	−1.1355** (0.4927)	−0.2826 (0.2283)	−0.0286 (1.0534)
Elasticity	−0.00535	−0.00539	−0.00245	−0.00131
Kleibergen–Paap rk Wald <i>F</i>	15.65	15.65	15.65	15.65
Observations	1,215	1,215	1,215	1,215

Notes: Information on the healthcare resources variables is obtained from Turkish Statistical Institute (TSI). The full sample is for the 2003–18 period, excluding 2012, at the 81-province level. Each cell shows the estimates for the ratio of migrants to natives, with year, province fixed effects, and region-year fixed effects. The 2SLS model instruments the refugee share utilizing a distance-based instrument. Standard errors, given in parentheses, are clustered at the province level. *** denotes statistical significance at the 1% level ($p < 0.01$), ** at the 5% level ($p < 0.05$), and * at the 10% level ($p < 0.10$), all for two-sided hypothesis tests.

panel B of Table 3).²⁵ Similar to Aygün et al. (2021), we do report a negative effect for doctors and no effect for hospital beds, both are in per capita terms.

Overall, our results suggest that the central government has made significant investments in healthcare resources in refugee-receiving provinces. Yet, the magnitude of this investment did not sufficiently compensate for the reduction in per capita availability of healthcare professionals in provinces with more refugees. Provinces that experience a disproportionate amount of refugee inflows encounter a significant shortage of medical professionals relative to provinces with less refugees. The supply of healthcare services does not seem to explain our positive effect on children's health. We should nonetheless acknowledge that we cannot exclude the possibility that the overall health system has been affected by the refugee inflows. Although it does not jeopardize our main results, our identification strategy cannot deal with general equilibrium effects. Furthermore, our proxies for healthcare services only account for the number of healthcare staff or hospital beds, but not for the quality of services.

²⁵Detailed results are provided in Appendix Tables A.16, with or without region-specific time trends and region-year fixed effects.

6.2. Labor market, income, and time allocation

Labor market competition. Two potential pathways through which migration flows can deteriorate children's health outcomes are fiercer competition in the labor market and related income shocks (Baez, 2011; Maystadt et al., 2019). In Turkey, recent research reports a notable job loss for natives in informal sector due to Turkish workers' being replaced with Syrian workers (Ceritoglu et al., 2017; Aksu et al., 2022).²⁶ The adverse employment effect is found to be more pronounced among disadvantaged groups, namely those who are less-educated, temporary-waged, and women in self-employment, and young workers in agricultural sector (Aksu et al., 2022). The job losses induced by migrant influx are likely to produce two opposite effects. The first effect is a reduction of income following possible job losses. Limited access to healthy nutrients, stemming from the households' reduced purchasing power, may prevent children from receiving an appropriate diet and thereby cause them to experience growth retardation. The second effect is less obvious. Unemployment, in particular among women, may translate into more time spent with offsprings. Women might allocate more time to invest in their children's health capital through more frequent healthcare visits and/or provision of healthier nutrition. That second mechanism is likely to be particularly binding in countries where child care is poorly developed.

To test these possibilities, we first explore the effect of refugees on Turkish mother's labor market outcomes. Based on the sample of Turkish women's being in the labor force at the time of survey, the 2SLS model indicates a negative and a statistically significant coefficient (panel A, column (1) of Table 4).²⁷ Mothers living in provinces that received a large number of refugees are less likely to be employed as compared to mothers residing in less affected provinces. The effect is quite sizable. A 10% increase in refugees correspond to a fall by 5 percentage points (pp) in the probability to be employed. Given the mean value of employment (0.15), that is equivalent to a one-third reduction in employment. The negative employment effect differs between better-educated and less-educated women. Syrian refugees, being on average less skilled, might not be plausible substitutes for better-educated natives in the labor market (Tumen, 2018). If this is the case, then one can expect to find null or even positive employment effects on better-educated mothers and to find negative employment effects on less-educated mothers. We divide our sample based on the completion of compulsory years of schooling.²⁸ Our results support this conjecture (panel A, columns (2) and (3) of Table 4).²⁹ Mothers with less than 12 years of education are more likely to be out of the labor market, while mothers with 12 or

²⁶Turkish government introduced a work permit system allowing registered Syrian refugees to access formal employment in 2016. In other words, Syrian individuals were employed in the informal sector with considerably lower wages as compared to Turkish natives before 2016. Erten Keskin (2021) provide evidence that Turkish native women are more likely to be displaced from the informal employment sector than native men due to the presence of Syrian workers.

²⁷Detailed results are provided in panel A, column (6) of Appendix Table A.17. The TDHS first asks "Have you ever worked?". The answer is based on "Yes" or "No" answer scheme. It then asks "Are you currently working?" to those who replied "Yes" to the first question. It is worth noting that we consider women who replied "No" to the first question as unemployed at the time of survey.

²⁸In Turkey, compulsory years of schooling has been raised from 8 years to 12 years in 1997.

²⁹Detailed results are provided in Panel A, Column (6) of Appendix Table A.18 for probability of working at the time of survey.

Table 4. Summary table II: labor markets, income and time allocation (2SLS results , with region-year FEs)

Dep. Var.	Selected maternal outcomes					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A	Working	Working Edu ≥ 12	Working Edu < 12	HAZ	HAZ Edu ≥ 12	HAZ Edu < 12
Refugee share (IHS)	-0.0505** (0.0220)	0.1156 (0.1056)	-0.0677** (0.0283)	0.7961*** (0.0.2085)	0.5421 (0.4859)	0.6911*** (0.2010)
Elasticity				0.0296	0.0604	0.0212
Kleibergen–Paap rk Wald <i>F</i>	27.24	12.74	29.83	27.24	11.51	27.80
Observation	5,341	636	4,705	5,341	636	4,705
Panel B	Wealth	Wealth Edu ≥ 12	Wealth Edu < 12	Time with offspring	Time Edu ≥ 12	Time Edu < 12
Refugee share (IHS)	-0.0084 (0.0767)	0.4600* (0.2727)	-0.0460 (0.0729)	0.0506* (0.0297)	0.2535 (0.1967)	0.0427* (0.0247)
Elasticity	-3.51 × 10 ⁻⁰⁵	0.0012	-0.0002			
Kleibergen–Paap rk Wald <i>F</i>	27.14	11.27	29.59	27.24	12.74	29.83
Observation	5,341	636	4,705	5,341	636	4,705
Panel C	Antenatal visits ¹	Antenatal Edu ≥ 12	Antenatal Edu < 12	Postnatal care	Postnatal Edu ≥ 12	Postnatal Edu < 12
Refugee share (IHS)	0.0990** (0.0447)	0.1377 (0.1340)	0.1069** (0.0466)	0.0070 (0.0111)	-0.0007 (0.0157)	0.0090 (0.0124)

(Continued)

Table 4. (Continued.)

Dep. Var.	Selected maternal outcomes					
	(1)	(2)	(3)	(4)	(5)	(6)
Elasticity	0.0005	0.0006	0.0006			
Kleibergen–Paap rk Wald F	27.16	11.04	29.88	28.29	12.74	29.90
Observation	5,323	634	4,689	5,336	636	4,700

Notes: Data come from Turkish Demographic and Health Survey (TDHS). The full sample is for the 2003–2018 period, excluding 2012, at the 81-province level. Individual and household controls include child's sex, child's month of birth, mother's age, mother's age square, mother's education, whether the mother resides in rural area, total number of older siblings, being a female headed household, and wealth index (not in wealth index regression). Year, province, and region-year fixed effects are included. Individual survey weights are used in each specification. Standard errors, clustered at the 81-province level, are in parentheses. *** denotes statistical significance at the 1% level ($p < 0.01$), ** at the 5% level ($p < 0.05$), and * at the 10% level ($p < 0.10$), all for two-sided hypothesis tests.

more years of education are not affected by the presence of refugees. The negative employment effect is found to be more prevalent for the native mothers with less education, who can be assumed to work in low-pay jobs. It is therefore natural to revisit our main results for children with low-educated mothers. We re-estimate equation 1 by stratifying our sample by mother's education. Children, whose mother did not complete compulsory years of education, experience an increase in their HAZ: the estimated quasi-elasticity is 0.021 (see panel A, column (5) of Table 4).³⁰ Taken together, job loss experienced by less-educated mothers is associated with a puzzling improvement in their children's health. A plausible explanation is that the likely negative income effect is compensated by time reallocation toward their offsprings.

Income effect. Health improvements are compatible with positive income induced by the presence of refugees. In other contexts, the presence of refugees has boosted the local economies (Taylor et al., 2016; Maystadt et al., 2019; Maystadt Duranton, 2019). For Turkey, it is less obvious (Aksu et al., 2022). To assess that possible explanation, we run equation 1 using the household wealth index. The estimated coefficients are far from being statistically significant (panel B, column (1) of Table 4).³¹ We cannot exclude the possibility that the null effect is driven by the importance of financial aid – either provided by central government or international organization. In any case, it does not seem sufficient to explain the observed health improvements.

Maternal time allocation. The crowding-out effect of refugees that left Turkish native women unemployed can increase the amount of time to be spent between mother and their offspring. This can have positive repercussions on children's health outcomes because mothers would be able to invest more in their children's health capital through several channels. Examples include, but are not limited to, increasing the frequency of received pre- or postnatal care and exerting more effort to provide a healthier diet, both of which are crucial for children's nutrition. To test this hypothesis, we explore the impact of refugees on the following outcomes: (1) mothers' time spent with their children, (2) the number of antenatal care visits, and (3) receipt of postnatal care within two months.³² Overall, our findings suggest that the presence of refugees increases (i) the time spent by mothers with their offsprings, (ii) the number of antenatal care visits, and (iii) the likelihood of receiving postnatal care two months after birth. The effects summarized in Table 4 are sizeable (see

³⁰Detailed results are provided in panel D of Appendix Table A.18. As expected, we do not find any improvement in the HAZ z-score for those who have mothers with 12 or more years of education (see columns (4)–(6)).

³¹Detailed results are provided in panel B of Appendix Table A.17. We also present the results by the completion of compulsory education in Appendix Table A.18.

³²In TDHS, women are asked how many times they attended antenatal care checks for their last birth during pregnancy. For postnatal check; however, women are asked whether their babies were examined by a health professional within two months after the birth. When it comes to the mothers' time allocation, the TDHS asks the following question "Who does spend time with child(ren) in your house primarily?" The answers are in a categorical form, ranging from "herself" to "no one". Using this question, a binary variable, taking value of 1 if the mother responded "herself" and 0 otherwise, is constructed. It should be noted that the TDHS does not provide information on the specific daily time allocation of Turkish mothers with their offspring.

panel B, column (4); panel C, columns (1) and (4)).³³ A 10% increase in the share of refugees leads to a 5 pp rise in the likelihood that the mother is spending time with her offspring, and a 9 pp increase in the number of antenatal care visits. These effects represent (i) a 6% increase in the maternal time spent with offspring and (ii) a 4% rise in the antenatal care visits at the mean values (0.75 for time spent and 2.02 for antenatal checks). For the probability of receiving postnatal care, our baseline specification, which allows for region-year FEs, reports a positive but statistically insignificant effect while the specification without region-specific trends shows a positive effect at 1% significance level (see panel B, column (4) of Appendix Table A.19). Therefore, we argue that antenatal and postnatal care increase because women have more free time due to maternal unemployment. Furthermore, we expect our results to be sensitive across educational level for these variables. We present our results in Appendix Table A.18 for maternal time spent with offspring at home (see panel C, column (12)), Appendix Table A.20 for antenatal care visits and receipt of postnatal care. Our findings on maternal time spent suggest that less educated women are more likely to spend time with their children at home (see panel C, column (12) of Appendix Table A.18). Nevertheless, we find no evidence of the refugee influx increases better educated mothers' time spent with their offspring. Such an increase in mothers' time allocation is likely to induce a rise in healthcare utilization which in turn can positively contribute to their children's growth patterns. As can be seen from panel A, column (12) of Appendix Table A.20, the effect is stronger for less educated mothers for antenatal care visits, while we report null results for better educated mothers. Regarding the likelihood of receiving postnatal care two months within birth, the positive effect is captured for less educated mother in the specification where we do not introduce region-trends and region-year fixed effects (see Panel B, column (10) of Appendix Table A.20). The positive effect, however, disappears once we add region-year FEs (see panel B, column (12)).

6.3. *The quantity-quality trade-off*

Conventional theories on family economics, especially on the intra-household resource allocation, suggest that parental decisions regarding the number of children and investments in children's human capital are interdependent. The theory posits that there exists a negative association between the number of children (i.e., quantity) and children-specific outcomes such as health and schooling (i.e., quality) (Becker Lewis, 1973; Becker Tomes, 1986).³⁴ Therefore, it is theoretically possible that the favorable effect of migration on children's growth indicators can be attributed to the quality-quantity trade-off: a decrease in the total number of children in the household can bring about an increase in the investment in health capital per child. To test whether such a trade-off exists, we run equation 1 where the dependent variable is the number of children per woman. Our investigation rejects that possible explanation (panel A, column (1) of Table 5).³⁵ Furthermore, Aygün et al. (2021) find no

³³Detailed results are provided in Appendix Table A.17 for maternal time allocation and Appendix Table A.19 for the number of antenatal care visits and the receipt of postnatal care two months within birth

³⁴Empirical investigation of the quality-quantity trade-off reports mixed results (Rosenzweig Wolpin, 1980; Black et al., 2005; Qian, 2006).

³⁵Detailed results are provided in panel A of Appendix Table A.21. We further show the births per woman by their education level in Appendix Table A.22.

Table 5. Summary table III: quantity–quality trade-off (2SLS results , with region-year FEs)

Dep. Var.	Selected child and maternal outcomes					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A	Total births	Births Edu ≥ 12	Births Edu < 12	Hepatitis B	Hepatitis Edu ≥ 12	Hepatitis Edu < 12
Refugee share (IHS)	0.3842*** (0.1050)	0.4361** (0.1944)	0.4285*** (0.1176)	−0.1283*** (0.0347)	−0.3241 (0.2422)	−0.1321*** (0.0388)
Elasticity	0.00163	0.00303	0.00173			
Kleibergen–Paap rk Wald <i>F</i>	27.29	12.84	29.80	29.17	6.24	28.72
Observation	5,341	636	4,705	2,689	342	2,347
Panel B	Tuberculosis	Tuberculosis Edu ≥ 12	Tuberculosis Edu < 12	Measles	Measles Edu ≥ 12	Measles Edu < 12
Refugee share (IHS)	−0.1309*** (0.0334)	−0.1284* (0.0706)	−0.1512*** (0.0377)	−0.2439*** (0.0945)	−0.4707** (0.2329)	−0.2634** (0.1054)
Elasticity						
Kleibergen–Paap rk Wald <i>F</i>	27.75	8.33	26.76	29.06	11.86	24.58
Observation	3,217	405	2,812	2,352	287	2,065

Notes: Data come from Turkish Demographic and Health Survey (TDHS). The full sample is for the 2003–2018 period, excluding 2012, at the 81-province level. Individual and household controls include child’s sex, child’s month of birth, mother’s age, mother’s age square, mother’s education, whether the mother resides in rural area, total number of older (not in total births per woman regressions), being a female headed household, and wealth index. Individual survey weights are used in each specification. Year, province, and region-year fixed effects are included. Individual survey weights are used in each specification. Standard errors, clustered at the 81-province level, are in parentheses. *** denotes statistical significance at the 1% level ($p < 0.01$), ** at the 5% level ($p < 0.05$), and * at the 10% level ($p < 0.10$), all for two-sided hypothesis tests.

evidence of a significant effect on child mortality. Second, possible changes in household size or fertility decisions do not seem to have been followed by an improvement in early childhood investment. We indeed explore children's probability of being fully vaccinated against hepatitis B, measles, and tuberculosis.³⁶ The 2SLS estimates are all negative and statistically significant at any conventional level (see Table 5, panel A, column (3) and panel B, columns (1) and (4)). That is, the likelihood of being fully immunized decreases in the provinces receiving a greater share of Syrian refugees as compared to provinces with a lower share of refugees. The results confirm the findings of Erten et al. (2022) who show a notable decline in the vaccination outcomes induced by the immigration shock. Nevertheless, the relationship between vaccination and child height is a complex one.³⁷ In our analysis, we consider vaccination as a way to measure early child investment in health. It is possible the reduction in vaccination mitigates the positive effect of refugees on the height of natives' children but at least, it cannot be a valid explanation for this positive effect on height. Our results might reflect a lower-bound estimate. If there was no detrimental effect on vaccination, our results may have been even stronger.

7. Conclusions

We investigate the effect of massive immigration shock induced by the Syrian Civil War on Turkish children's anthropometric indicators. Dealing with the endogeneous settlement of Syrian refugees across 81 Turkish provinces, we find that the Turkish children's HAZ *z*-score is significantly higher in the provinces with a large share of refugees. This finding contradicts existing evidence which report a substantial decline in native children's growth indicators in the African contexts. Our additional results suggest that a plausible explanation is the increase in mothers' time spent with their offsprings, paradoxically as a result of job losses mostly experienced by low-skilled women. We indeed confirm that children's health improvement is concentrated among households with low-educated mothers. We do not find evidence for alternative explanations related to the investment in healthcare resources, an income shock, or the quality–quantity trade-off in children's human capital investment. On the contrary, we confirm previous results such as a decrease in the per capita availability of healthcare resources (Aygün et al., 2021) and a lower probability of being fully vaccinated among children (Erten et al., 2022) in Turkey. These confirmed results do not explain the observed positive impact on child growth. If anything, it suggests some lower-bound estimates. If healthcare system and vaccination outcomes had not been negatively affected, the magnitude of the positive effect could have been even stronger.

³⁶Detailed results on the probability of vaccine completion are provided in Appendix Table A.21 (see panel B for hepatitis, panel C for tuberculosis (BCG), and panel D for measles).

³⁷On the one hand, childhood vaccination can positively contribute to the children's nutritional status by disease protection and thus lead to better physical growth patterns in developing countries. Substantial portion of existing research associates vaccination intake with reductions in stunting and wasting in children under five years of age (Adair Guilkey, 1997; Frongillo et al., 1997; Anekwe Kumar, 2012; Ignis Tomini, 2022). Others report that there is no statistically significant link between vaccination take up and children's height and weight (Bloom et al., 2012). On the other hand, vaccination may create a selective mechanism through its effects on mortality and morbidity. That is, the effect of vaccination might be heterogenous on children having better health outcomes versus children at the bottom of the health distribution.

It is important to be careful when interpreting the health improvements associated with the job loss experienced by mothers with low levels of education. While the loss of job among low-educated mothers is a source of concern, our paper sheds light on a crucial trade-off associated with parental participation into the labor markets in absence of strong child care services. From a policy perspective, maternal unemployment is certainly not a desirable channel to improve child health. However, it highlights the importance of child care provision, especially in a middle-income country like Turkey. When the provision of child care remains at sub-optimal levels, women are likely to encounter a trade-off between engaging in their career via formal employment and staying at home. Accessible and affordable child care is a potent tool to boost the equality of opportunity by promoting women's participation to labor market and child development in later stages of life (Blau Currie, 2006; Currie Almond, 2011; Ruhm Waldfogel, 2012). Despite a notable progress in the availability of preschool and child care facilities, enrollment rates remained at low levels (World Bank, 2015).³⁸ One possible reason for low enrollment can be the fact that public preschools target children aged 4–5. Population shock induced by the continuous arrival of refugees, on the other hand, is likely to reduce the enrollment rate when considering the negative relationship observed between childcare supply and population density in Turkish provinces (World Bank, 2015). Altogether, our research indirectly sheds light on the importance of extending child care at younger age. It is critical because extending child care can foster women's employment (by freeing up women's time) and hence economic development (Duflo, 2012).

Finally, this paper is not without limitations. Our analysis consists in assessing the change in health outcomes in refugee-hosting provinces compared to other provinces. We are therefore not able to estimate general equilibrium effects. For instance, we are not able to capture the consequences of a general decrease (due to budget re-allocations) or increase (due to international aid) of the central government budget dedicated to healthcare. There also exist a number of unexplored channels due to lack of data. First, improvements in the anthropometrics are parallel to the supply of satisfactory nutrition intake. Unfortunately, the TDHS does not ask sufficiently detailed nutritional intakes from the time of birth. Instead, it asks whether the child(ren) has been given some particular foods/beverages (e.g., milk, juice, eggs, bread, meat, and fish) within the last 24 h. One alternative outcome could be breastfeeding duration or exclusivity of breastfeeding to measure nutrition. However, there are a number of contributors to duration and exclusivity of nursing (e.g., mother's fertility preferences, sibling sex composition, and size) (Jayachandran Kuziemko, 2011; Chakravarty, 2015). Therefore, it is not straightforward to distinguish such effects from refugees' arrival and it is beyond our paper's scope. Second, we do not investigate possible changes in healthcare provider. The information is available in the TDHS but cannot be exploited. Beyond the endogenous nature of the provider choice, there is only a limited number of mothers with a private healthcare insurance. For instance, in 2013, less than 2% of mothers reported to have access to a private health insurance. Third, the time allocation (at home) question in the TDHS is far from providing an ideal measure when quantifying the changes in the time spent between mother and children.

³⁸From 2006 to 2015, Turkey experienced a sizable increase in the number of preschool and child care providers, i.e., the total number of providers has risen by almost 31%, while 73% of this increase was provided by the public sector (World Bank, 2015)

Supplementary material. The supplementary material for this article can be found at <https://doi.org/10.1017/dem.2024.1>

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